

From: Whittaker, Laura [laura.whittaker@aptim.com]
Sent: Tuesday, August 21, 2018 2:19 PM
To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]
CC: Slack, Matthew L CIV SEA 04 04N [matthew.slack@navy.mil]; Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Noble, Kimberly K CIV SEA 04, NAVSEA DET RASO [kimberly.k.noble1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Amy Mangel [amy.mangel@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Gerg, David [david.erg@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]
Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY B3 (Use 11)
Attachments: HPNS APTIM RSY B3 (Use 11) Soil Non-LLRW Concurrence Request 08212018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.



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APTIM
Hunters Point Naval Shipyard
200 Fisher Avenue
San Francisco, CA 94124



Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013						
RSY Pad: B3	RSY Pad Use Number: USE 11	First Submittal <input checked="" type="checkbox"/>	Second Submittal <input type="checkbox"/>			
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 08/21/2018				

Soil Sample Data						
Sample Identification	Survey Location	Type of Sample	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁶⁰ Co Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
		Upper limit of site reference background	1.633	0.113	0.252	0.331
PE2-RSYB3-U11-S001	1	Systematic	0.704	0.00173	0.0326	0.0679
PE2-RSYB3-U11-S002	2	Systematic	0.716	0.0246	0.0219	N/A
PE2-RSYB3-U11-S003	3	Systematic	0.465	0.0202	0.0505	N/A
PE2-RSYB3-U11-S004	4	Systematic	0.697	-0.00375	0.0227	N/A
PE2-RSYB3-U11-S005	5	Systematic	0.609	-0.0515	0.0311	N/A
PE2-RSYB3-U11-S006	6	Systematic	0.599	-0.0122	0.0683	N/A
PE2-RSYB3-U11-S007	7	Systematic	0.589	-0.0341	0.0245	N/A
PE2-RSYB3-U11-S008	8	Systematic	0.872	0.0391	0.095	N/A
PE2-RSYB3-U11-S009	9	Systematic	0.632	0.0326	-0.0737	N/A
PE2-RSYB3-U11-S010	10	Systematic	0.449	-0.0471	0.0468	N/A
PE2-RSYB3-U11-S011	11	Systematic	0.492	-0.00646	0.0148	0.083
PE2-RSYB3-U11-S012	12	Systematic	0.596	-0.0442	0.0164	N/A
PE2-RSYB3-U11-S013	13	Systematic	0.913	0.0130	-0.0761	N/A
PE2-RSYB3-U11-S014	14	Systematic	0.522	-0.00361	0.097	N/A
PE2-RSYB3-U11-S015	15	Systematic	0.599	0.0341	0.0689	N/A
PE2-RSYB3-U11-S016	16	Systematic	0.721	0.000	-0.00392	N/A
PE2-RSYB3-U11-S017	17	Systematic	0.585	-0.00326	0.0242	N/A
PE2-RSYB3-U11-S018	18	Systematic	0.402	-0.0799	-0.0359	N/A

¹³⁷Cs Cesium-137
⁶⁰Co Cobalt-60
²²⁶Ra Radium-226
Sr Strontium
pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-07162018-PE2-ROV2-2757	07/16/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,872 CPS	3,258-3,910 CPS
RSI Follow-up Static Survey	HPRS-07182018-PE2-JSS2-2775	07/18/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,460-3,855 CPS
Systematic Sample Survey	HPRS-07162018-PE2-JSS-2760	07/16/2018	2221	06/29/2018	117634	15,069 CPM	17,241 CPM	N/A	N/A	14,371-15,681 CPM

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

Summary
1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).
2) RSI Follow-up static survey—23 locations identified during the data review process were investigated, with readings less than the Reference Area static IL at all locations for regions of interest (ROIs) 3, 6, 7, 8, and 9 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).
3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 35-58). Ten percent of the systematic soil samples (two samples in total, PE2-RSYB3-U11-S001 & PE2-RSYB3-U11-S011) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 35-58).
Conclusions: All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 23 locations were investigated during the follow-up static survey, with readings less than the Reference Area static IL at all locations for ROIs 3, 6, 7, 8, and 9 (VD1). Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 9-31). Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 32-34). Ten percent of the systematic soil samples (two samples in total, PE2-RSYB3-U11-S001 & PE2-RSYB3-U11-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1). RSY B3 (Use 11) contains soil from Survey Unit areas undergoing revetment construction. APTIM request RASO concurrence to release this soil as Non-LLRW. Disposition: This soil shall be dispositioned as non-LLRW waste to be stockpiled onsite following appropriate chemical characterization.

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
 - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ($Z>3$) is marked for follow-up.
 - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local $Z>3$ is marked for follow-up.
 - **Semi-local Z-Scores:** Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local $Z>3$ is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
 - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a $Z>3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local $Z>3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local $Z > 3$ is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

Where:

$$L_C = 2.33\sqrt{B}$$

LC	=	critical level (counts)
B	=	average background in the ROI

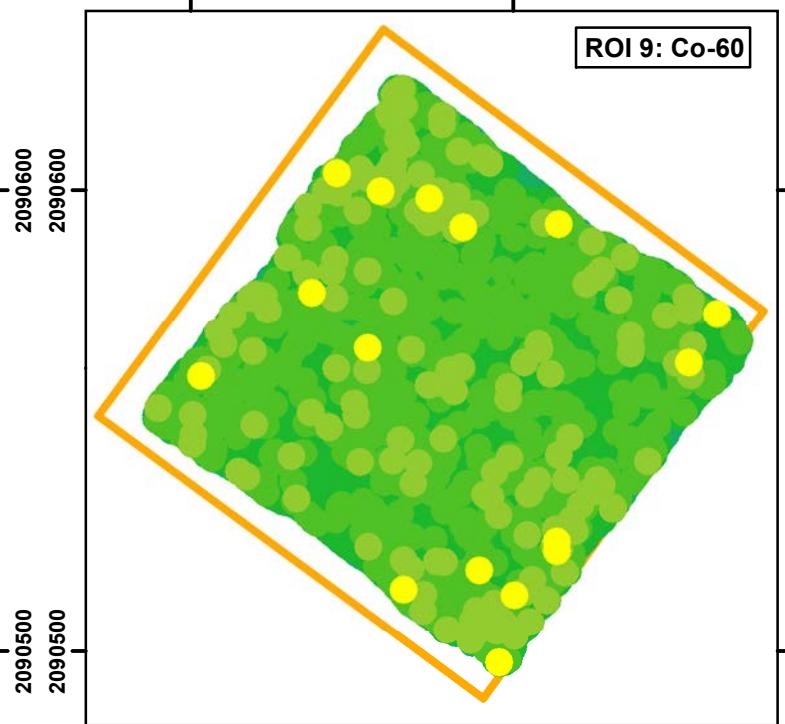
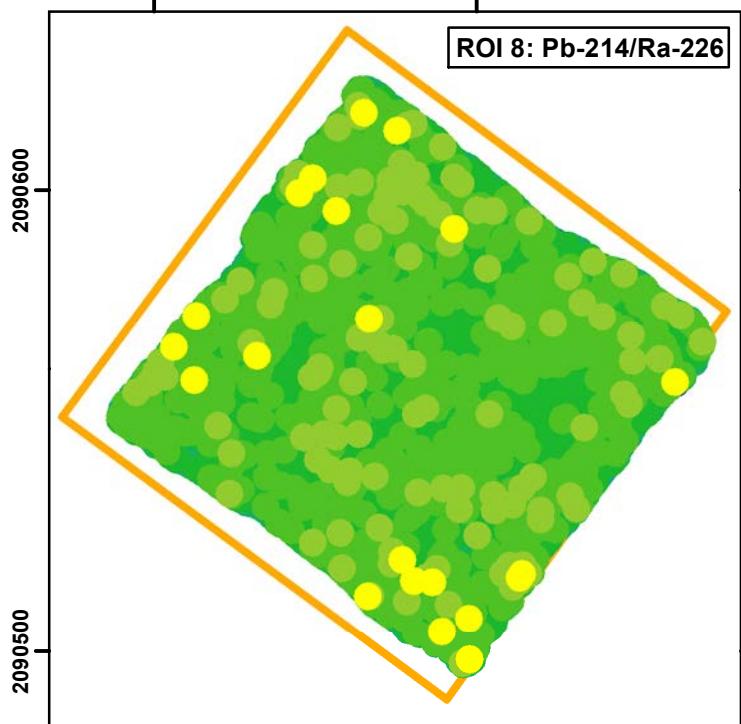
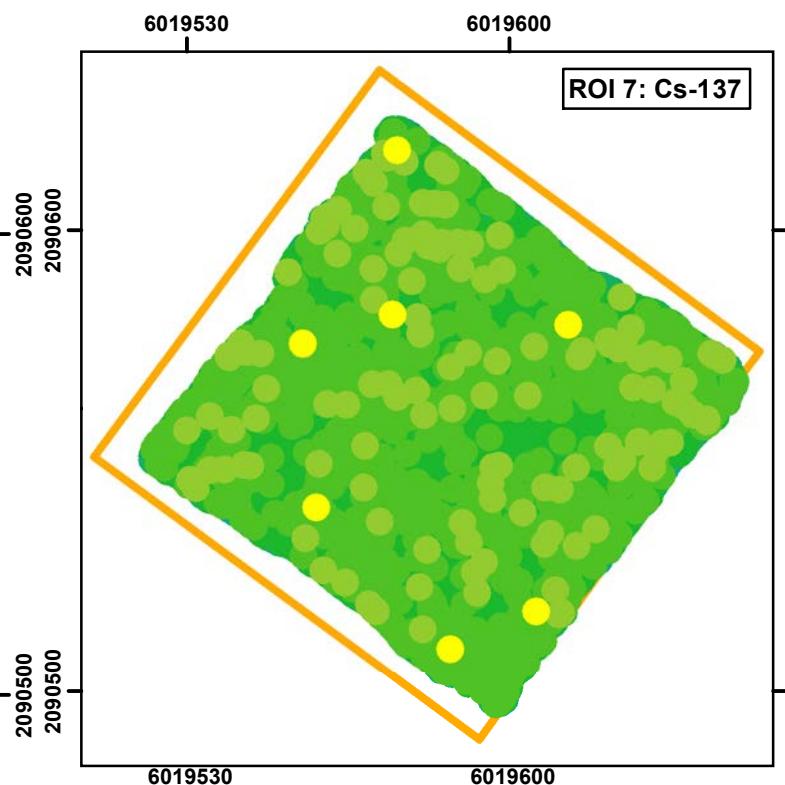
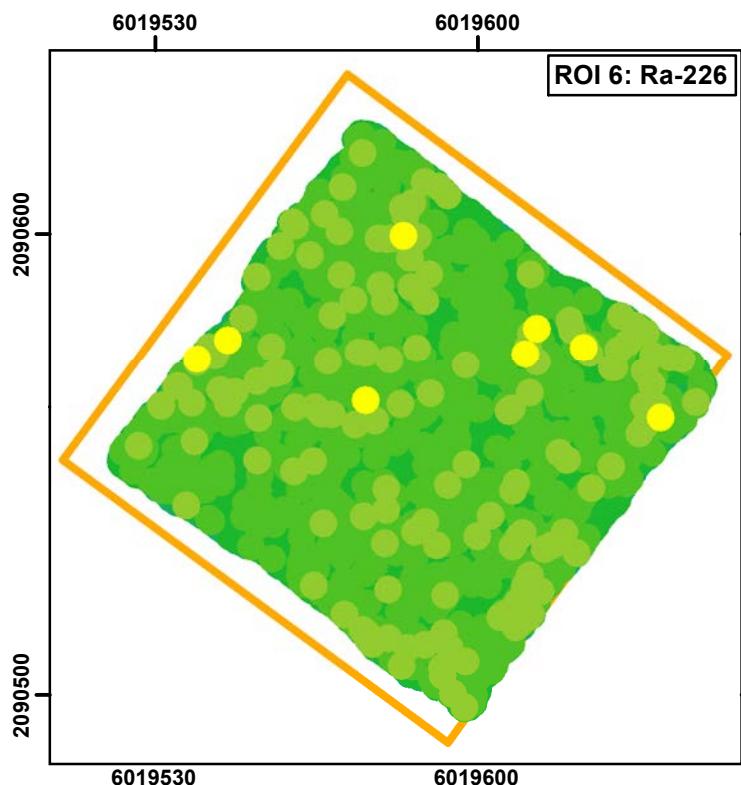
When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

Contour Map

HPNS Parcel E-2 RSY Pad B3 (Use 11)

Soil Excavation Site:
Revetment Spoils



RS 700 Gamma Walkover Data (VD1)

- | | |
|-------------------------------------|--------------------------------|
| Yellow dot: > 3 std dev | Green dot: > -1 to < 0 std dev |
| Light Green dot: > 2 to < 3 std dev | Cyan dot: > -2 to < -1 std dev |
| Dark Green dot: > 1 to < 2 std dev | Blue dot: > -3 to < -2 std dev |
| Dark Blue dot: > 0 to < 1 std dev | Dark Blue dot: <-3 std dev |
- RSY Pad Boundaries** (Orange Box)

Coordinate system: CSP Zone III, NAD83, US Survey Foot

0 15 30 60 Feet



RSI Review Summary

Summary:

23 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at these locations do not indicate the presence of ^{226}Ra , ^{137}Cs , or ^{60}Co above background. Gamma static readings at these locations are less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 9; figures are provided on pages 9-31.

RSI Follow-up Static Survey
HPRS-07182018-PE2-JSS2-2775

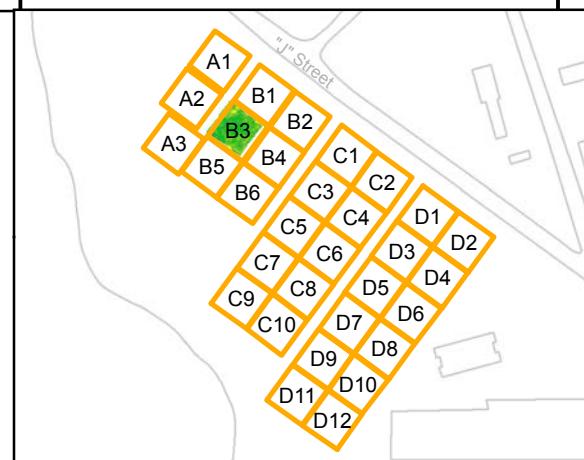
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Soil Excavation Site:
Revetment Spoils

6019530

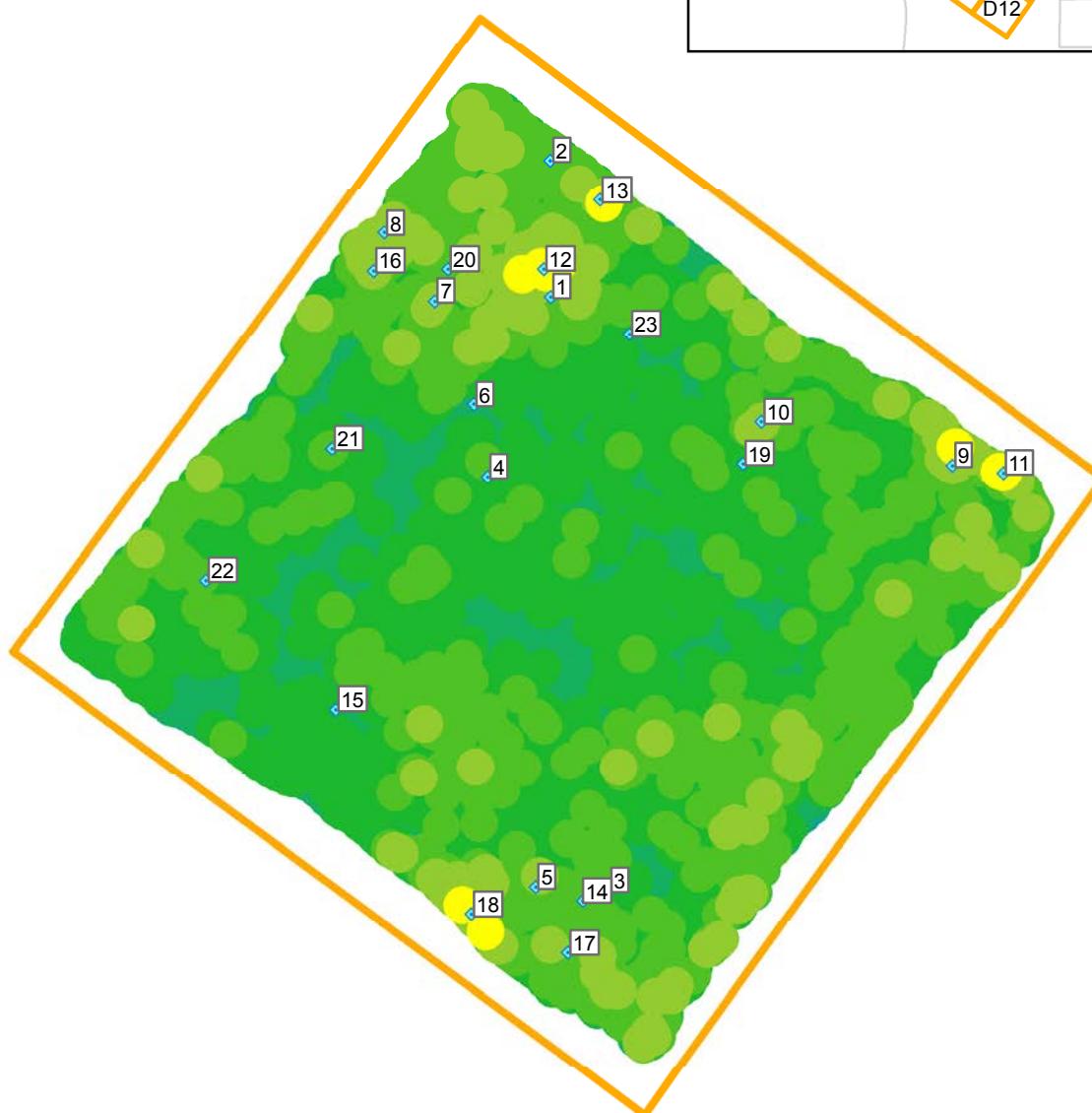
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6019670



2090600

2090600



RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

- ◆ Follow-up Locations
- > -1 to < 0 std dev
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- RSY Pad Boundaries

0 10 20 40
Feet

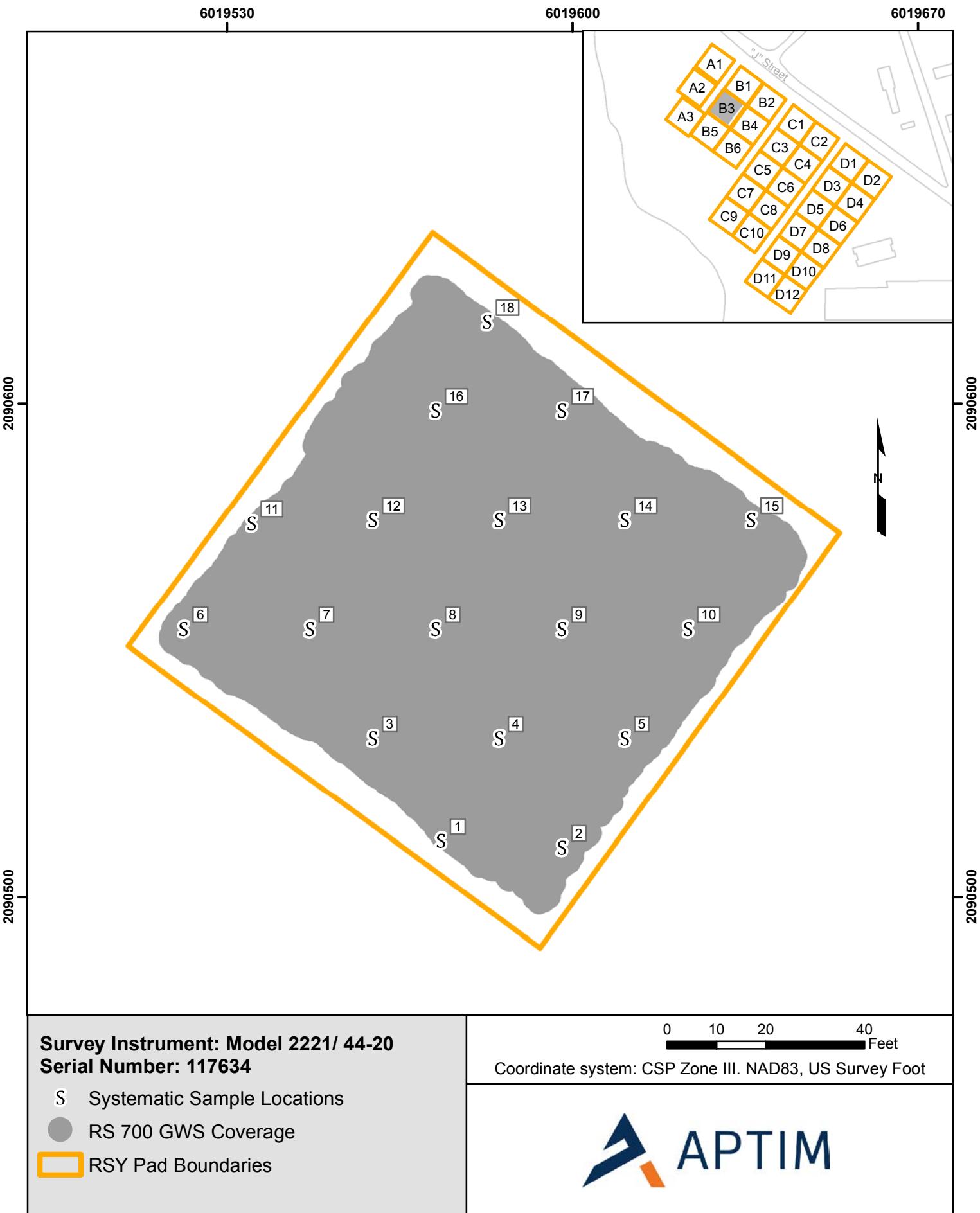
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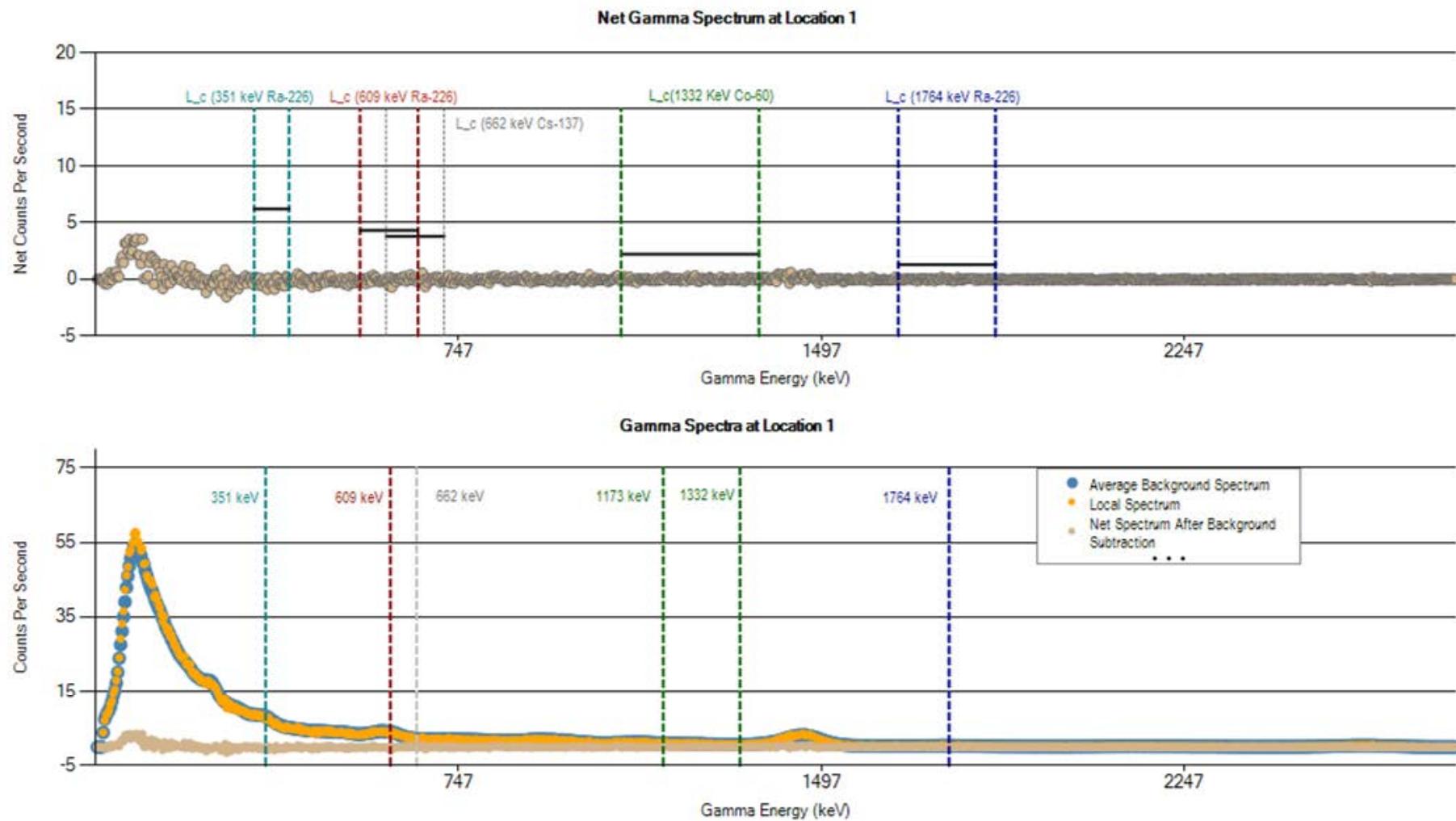


Systematic Sample Survey
HPRS-07162018-PE2-JSS-2760

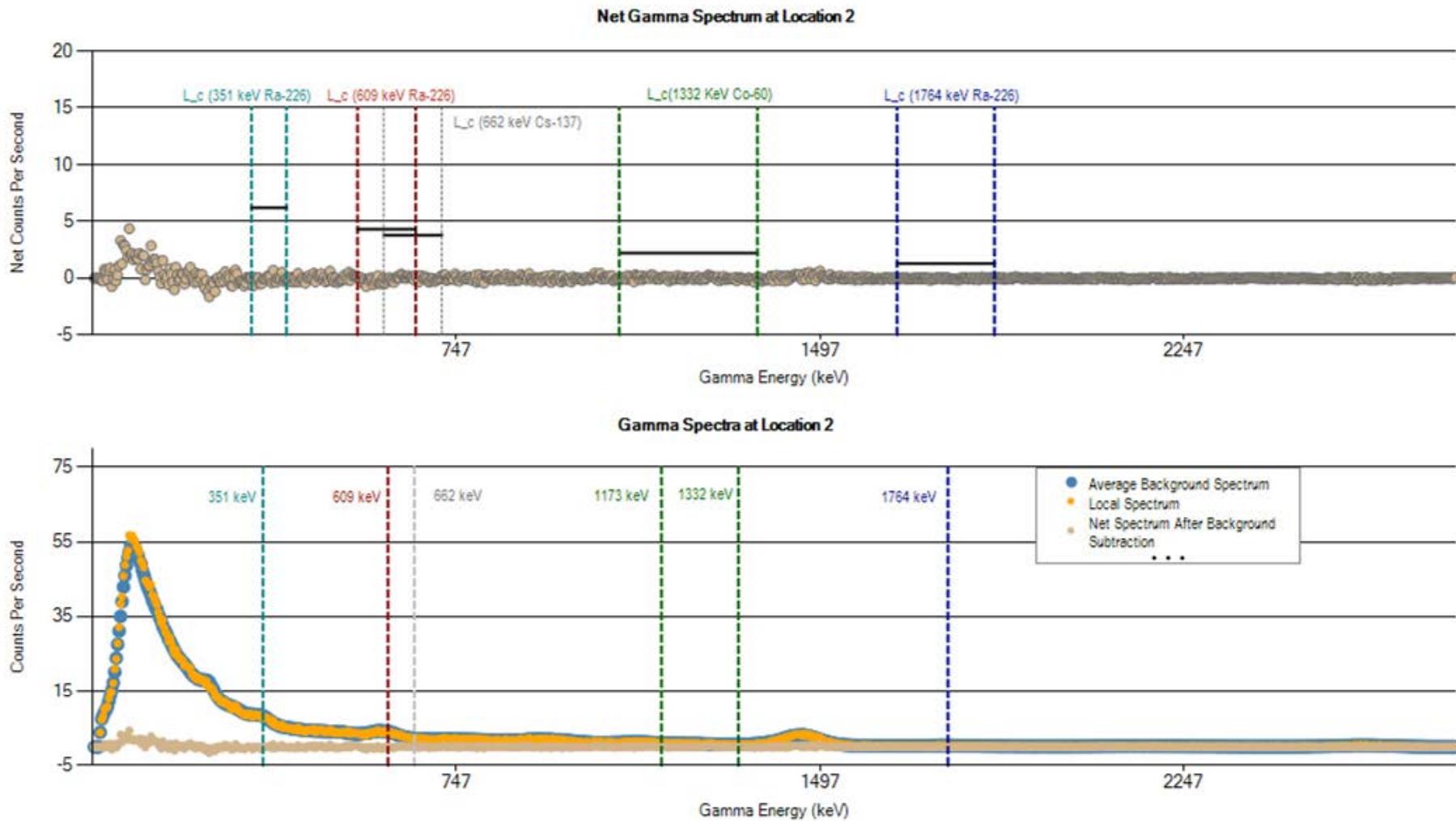
HPNS Parcel E-2 RSY Pad B3 (Use 11)

Soil Excavation Site:
Revetment Spoils

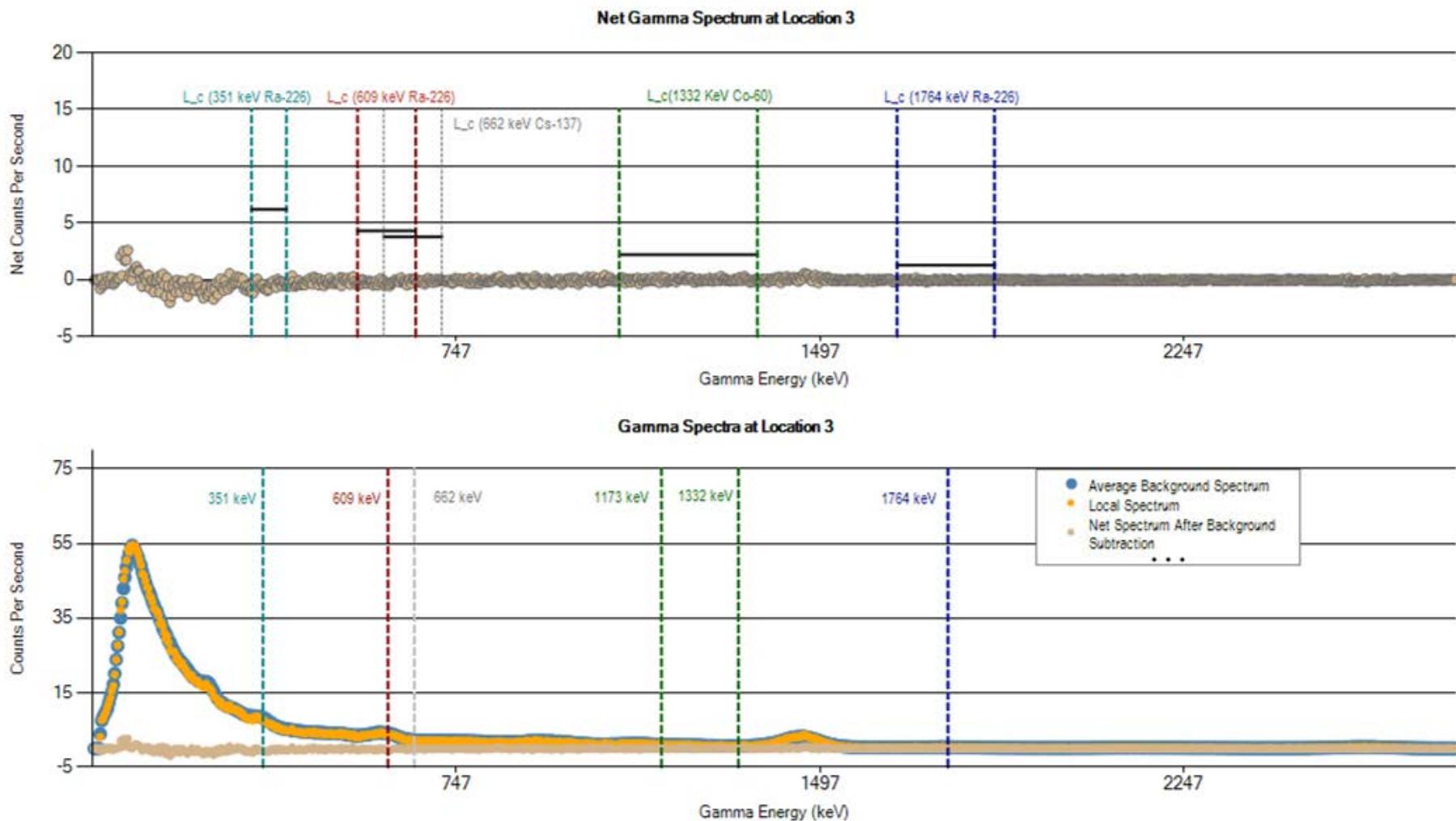




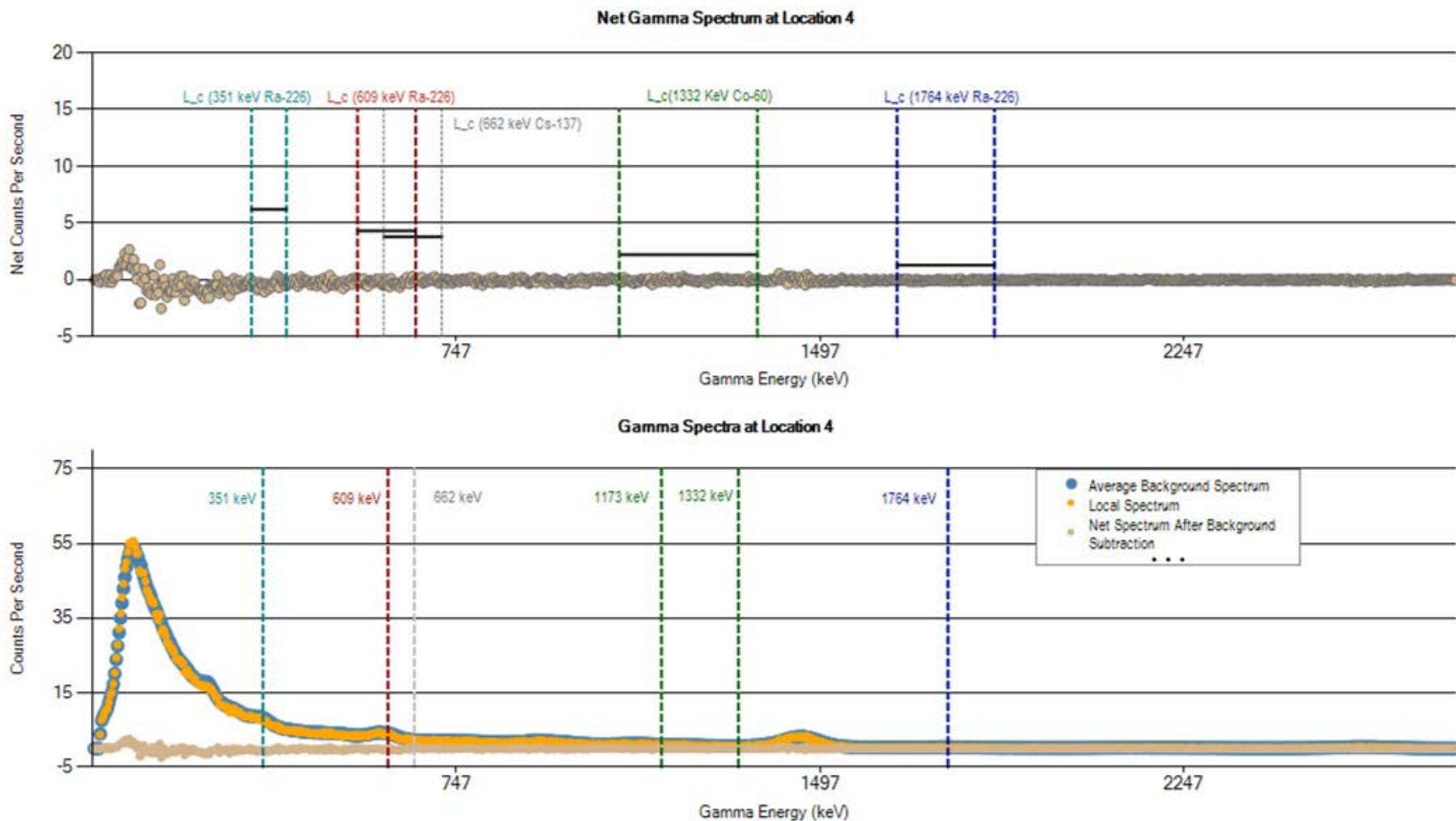
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Location 1 (cps)	845	120	20	23	147	138	106	168	88	3646
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



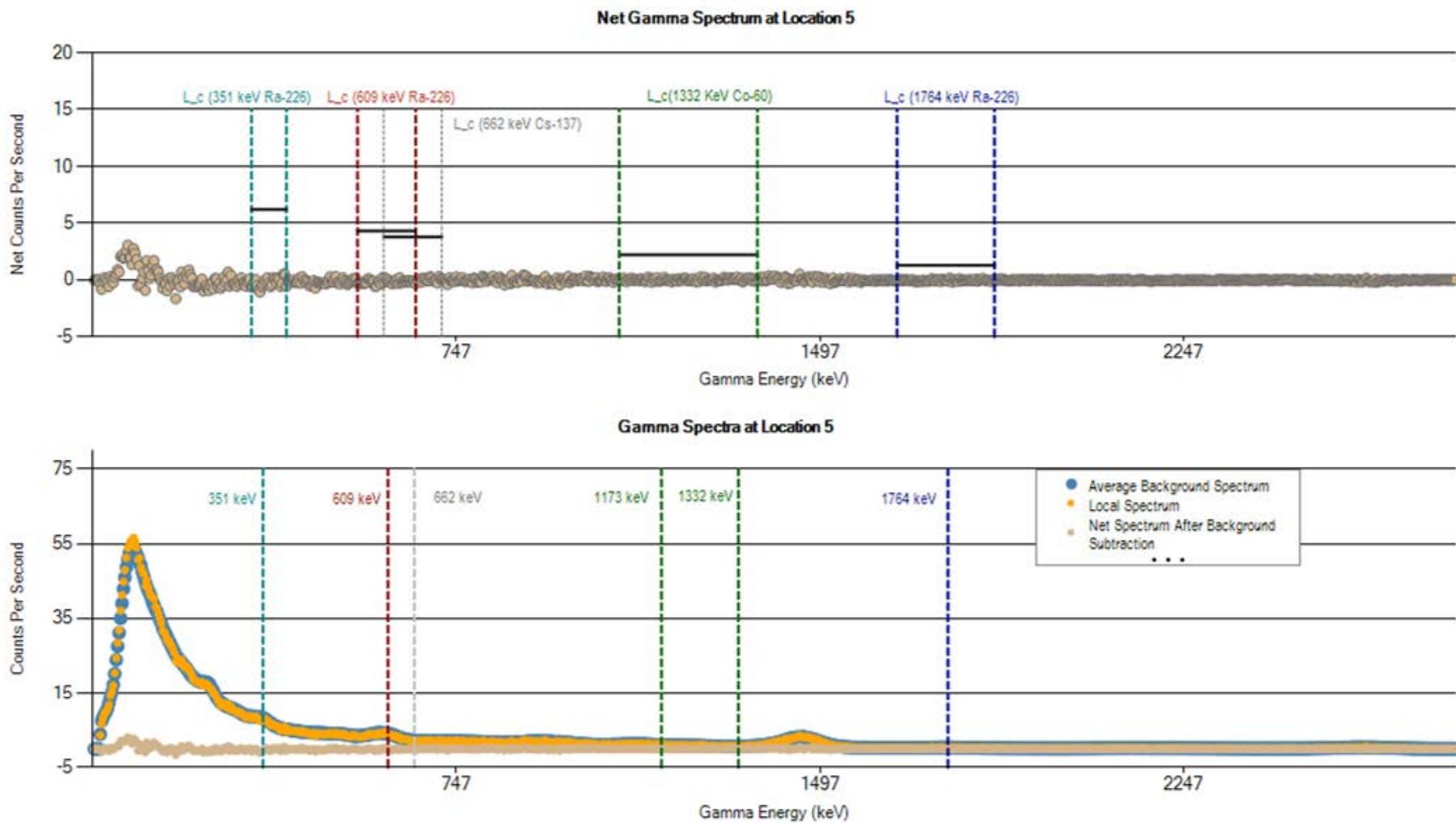
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Location 2 (cps)	848	120	19	21	151	137	107	173	89	3650
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



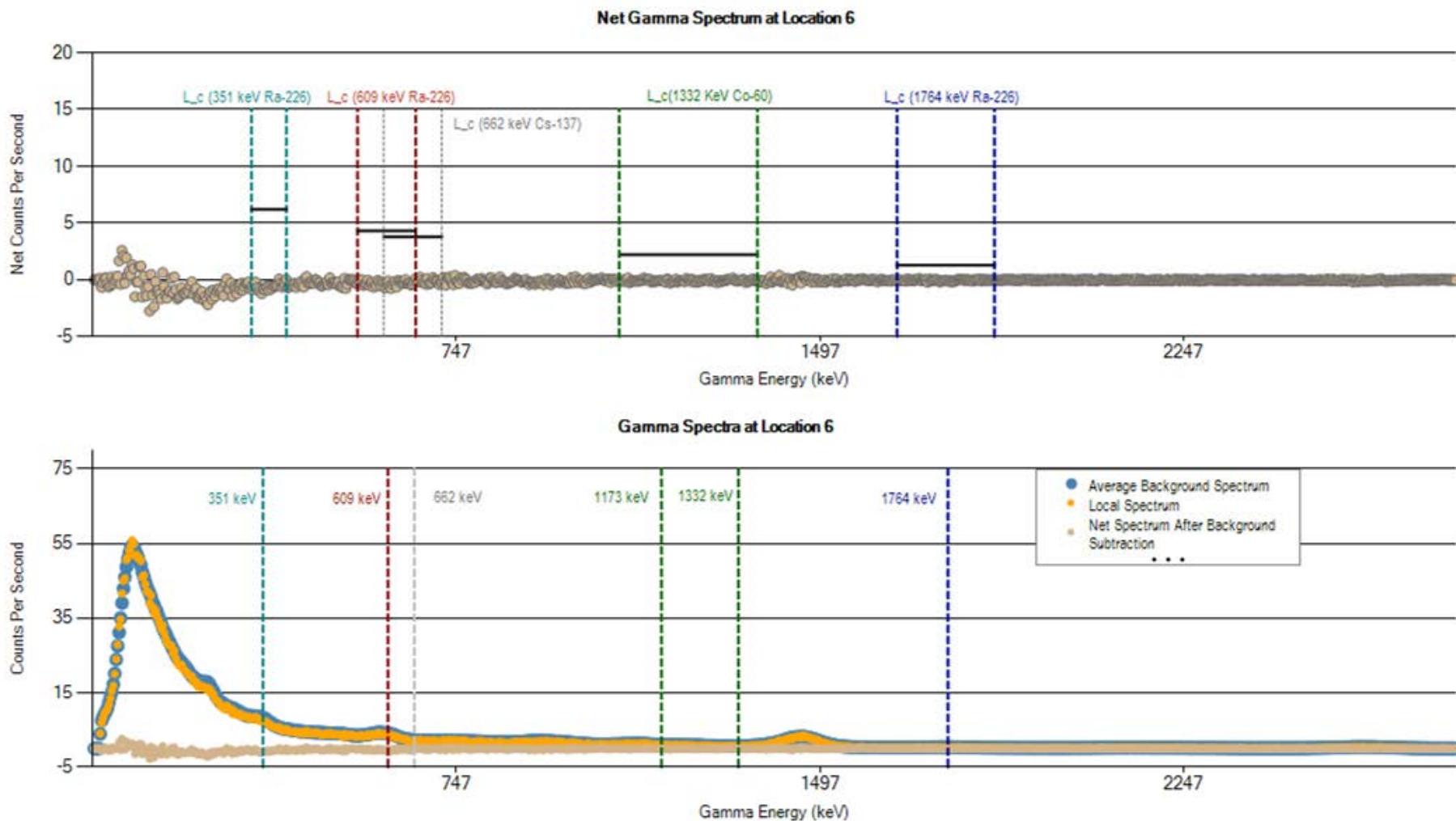
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Location 3 (cps)	822	119	19	20	145	133	102	163	89	3543
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



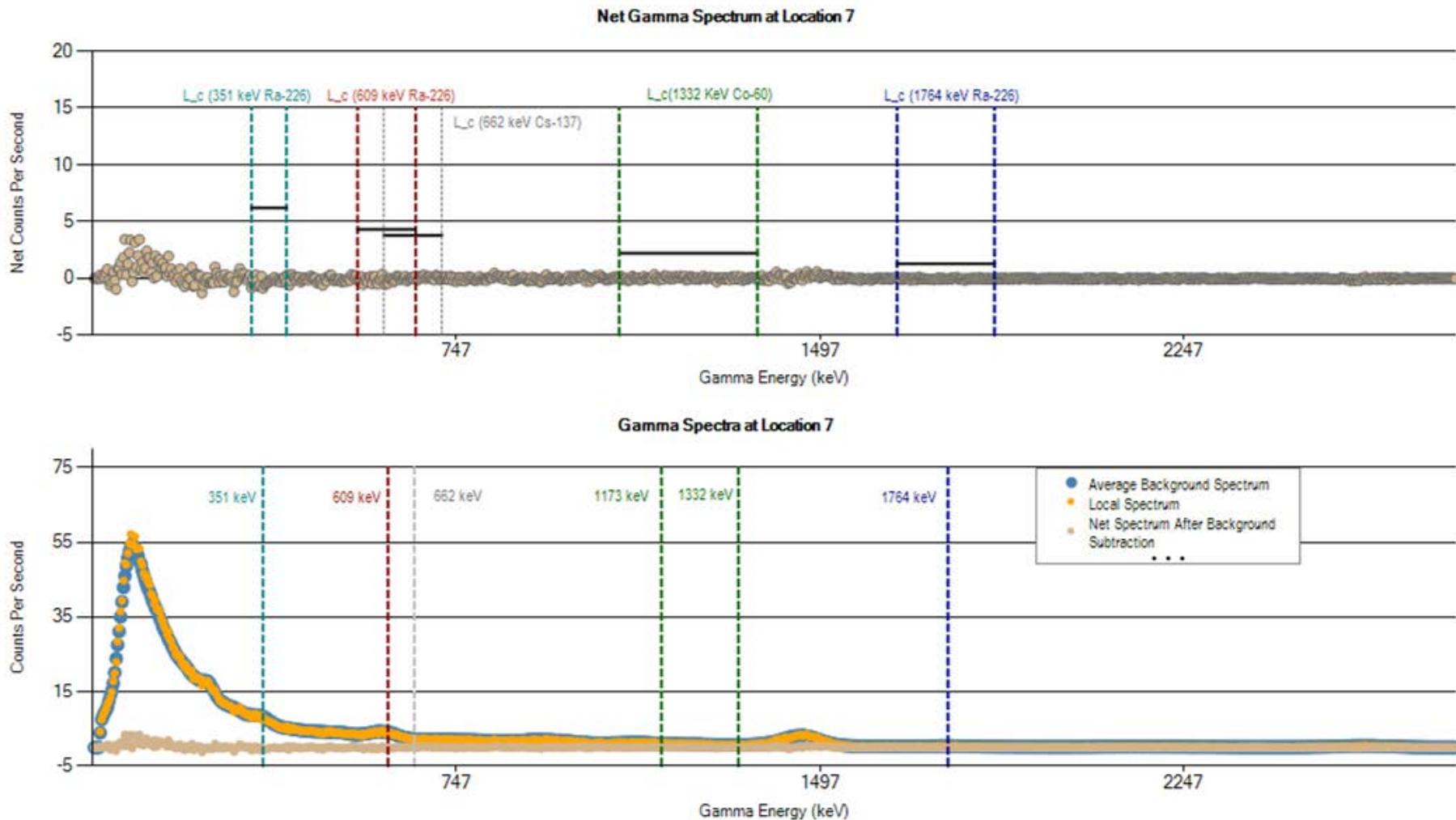
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Location 4 (cps)	814	113	18	21	143	132	102	164	85	3531
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



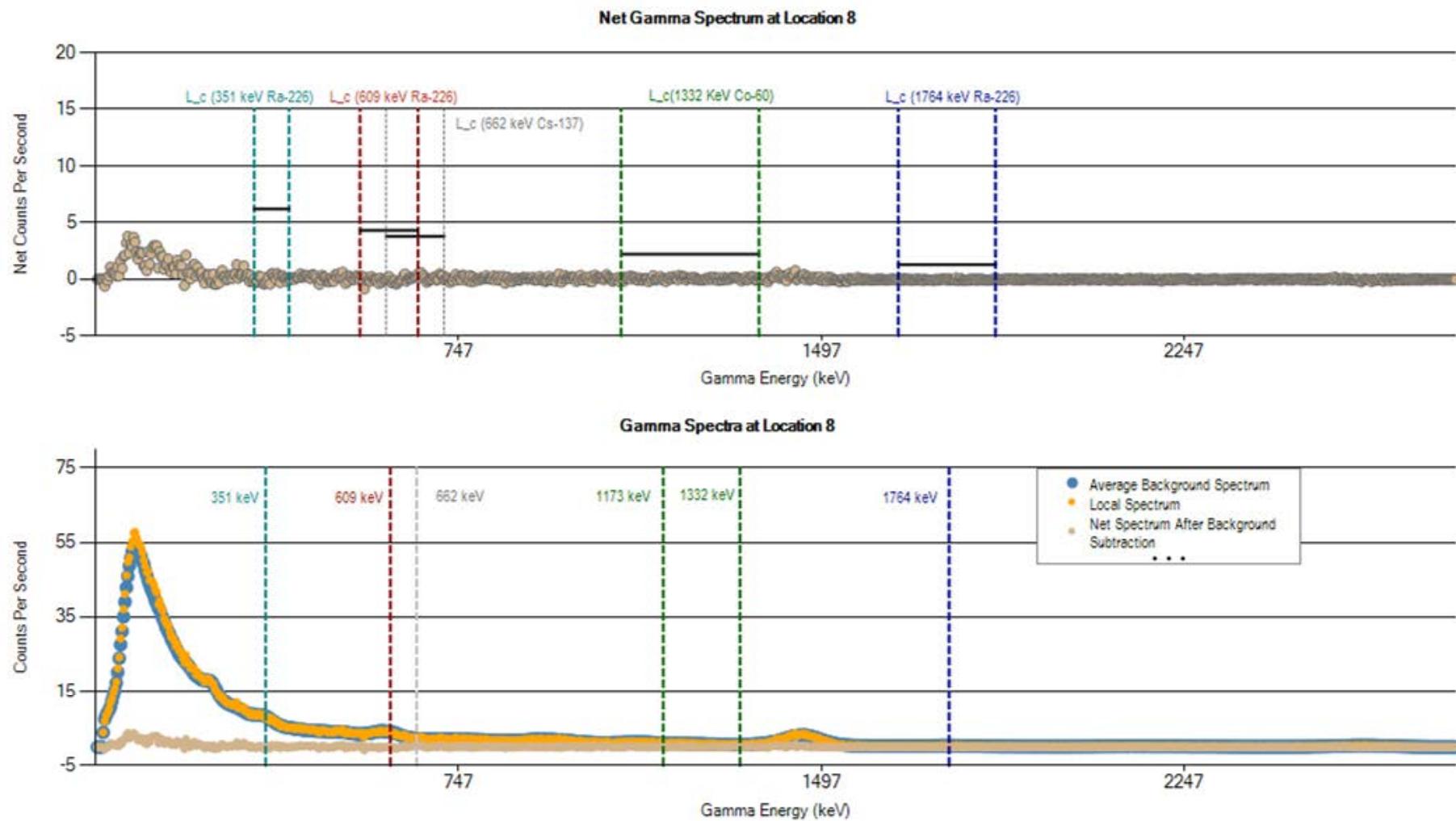
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Location 5 (cps)	834	118	18	21	145	134	106	169	91	3605
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



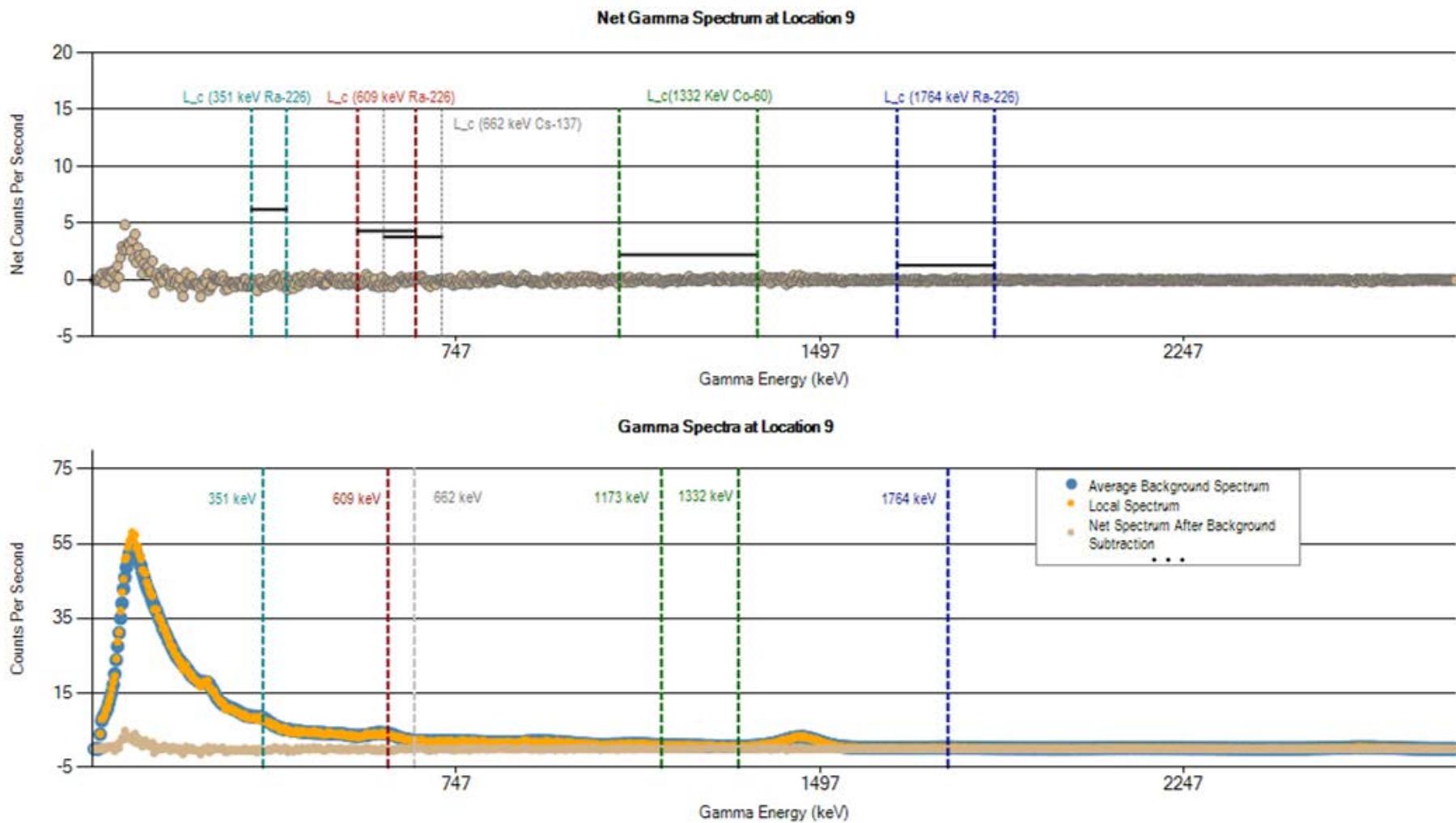
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 6 (cps)	796	113	18	20	141	128	98	160	83	3474
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



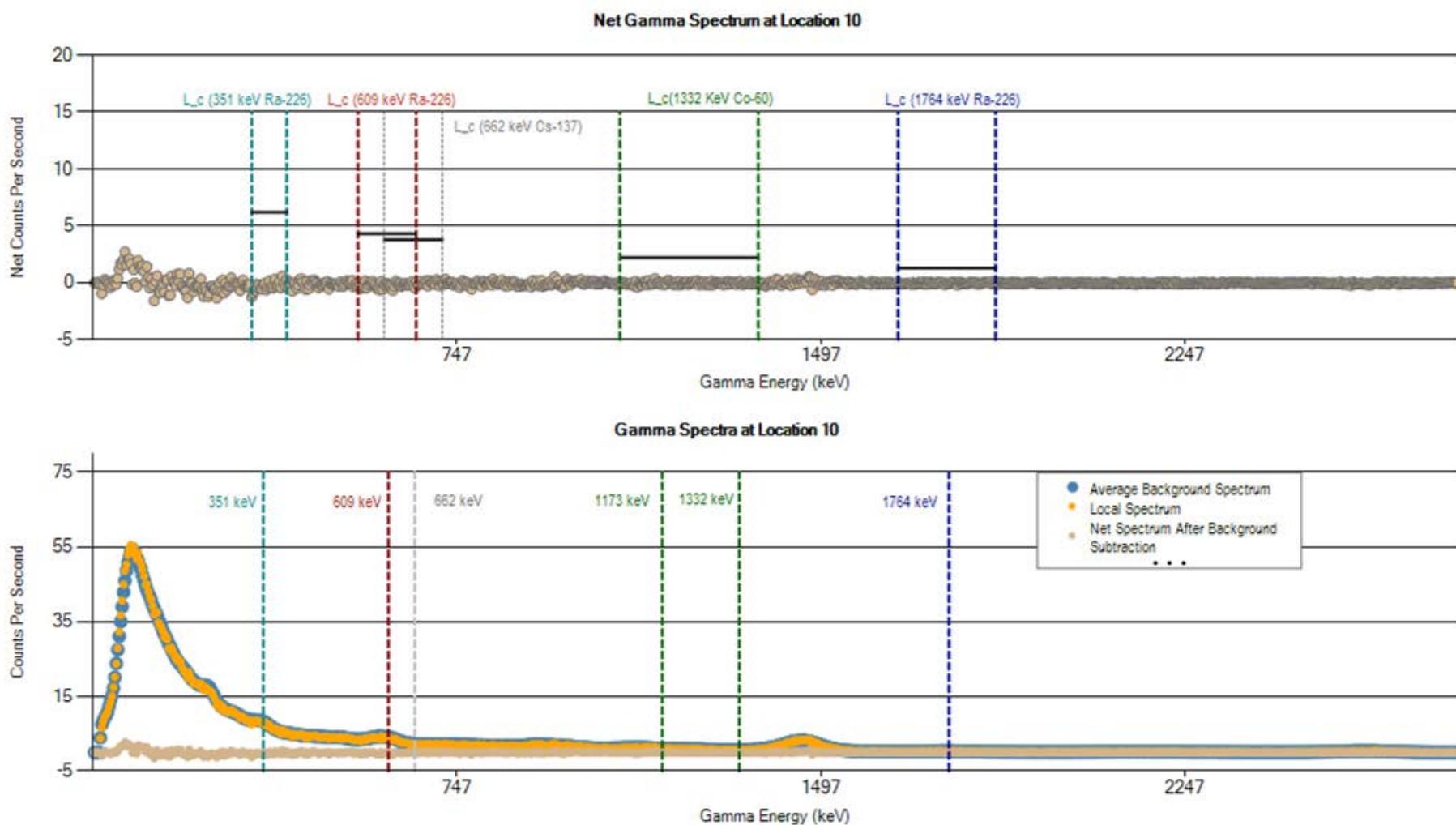
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Location 7 (cps)	851	121	18	21	148	137	107	169	91	3650
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



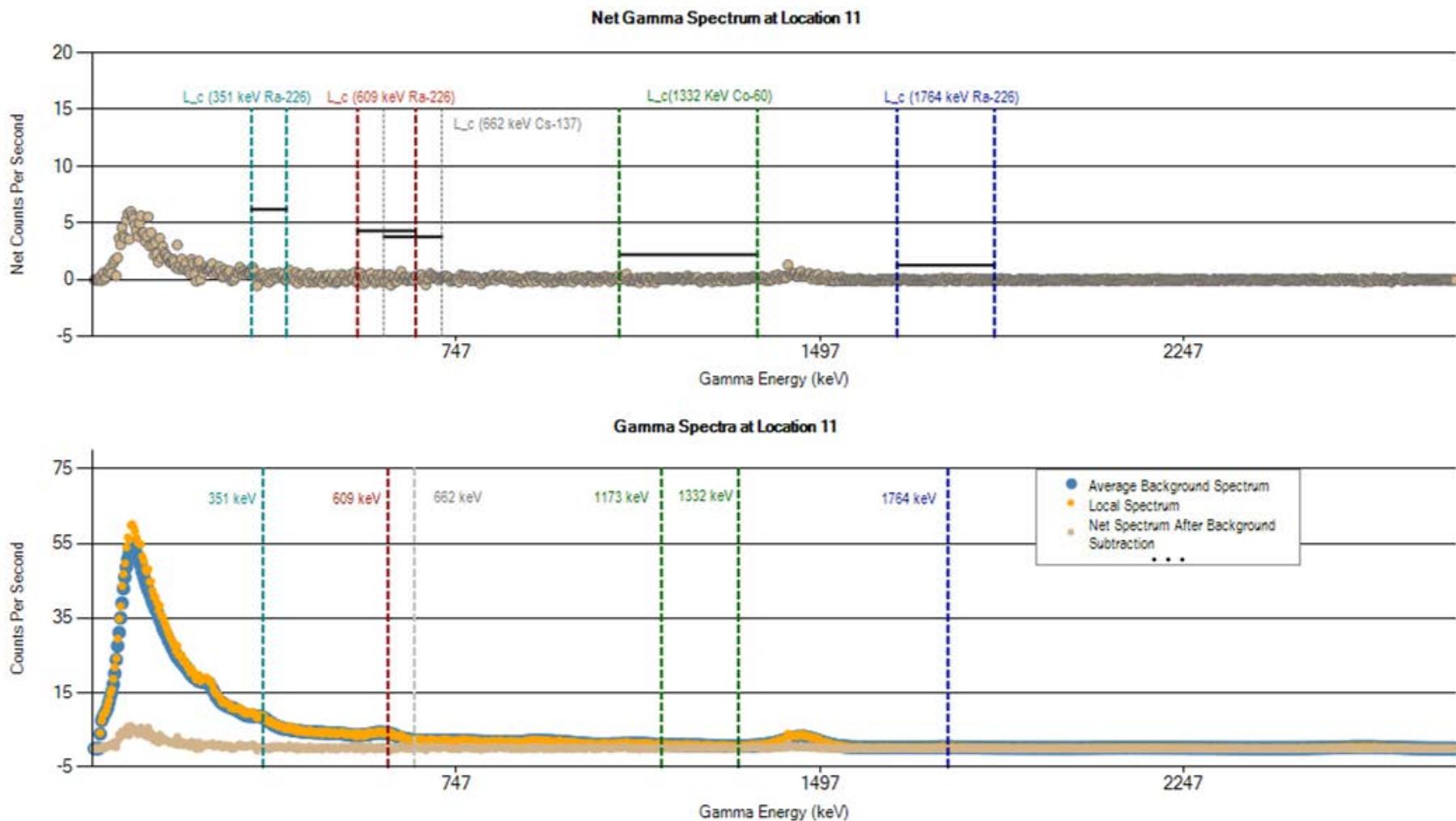
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Location 8 (cps)	872	121	18	22	153	140	111	175	94	3734
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



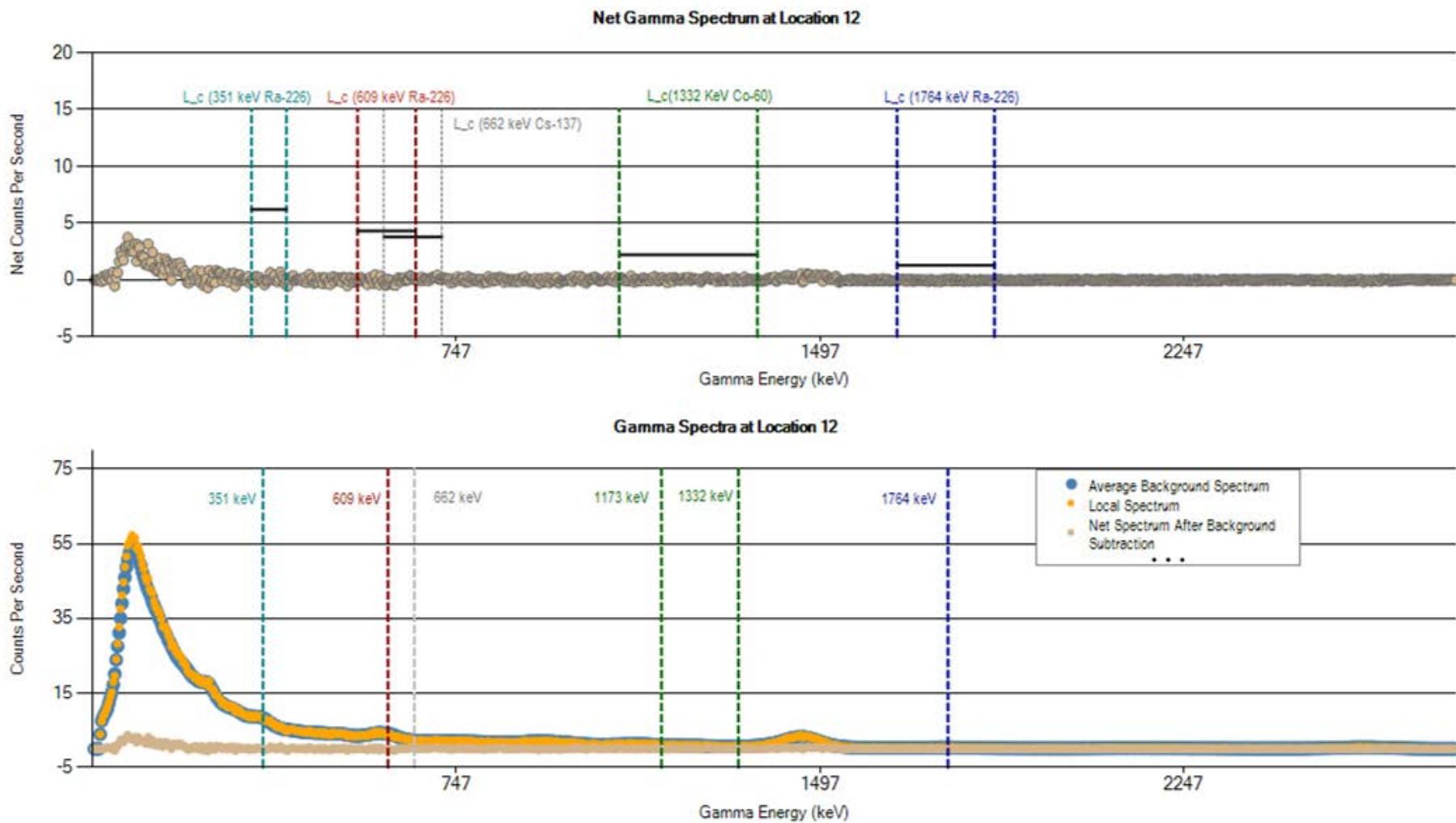
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Location 9 (cps)	833	116	18	22	148	134	104	168	90	3624
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



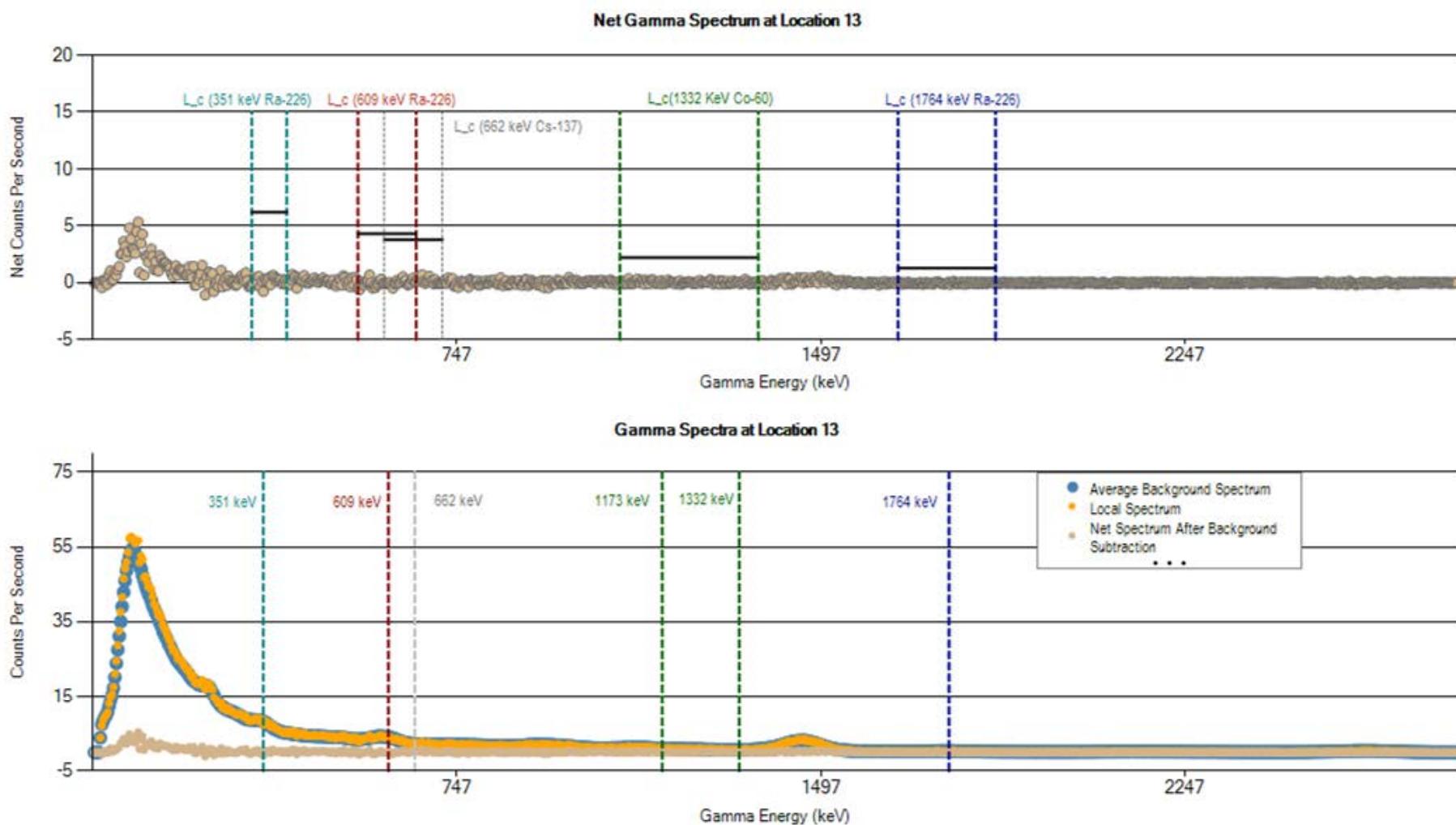
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Location 10 (cps)	825	116	18	21	146	132	103	168	86	3578
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



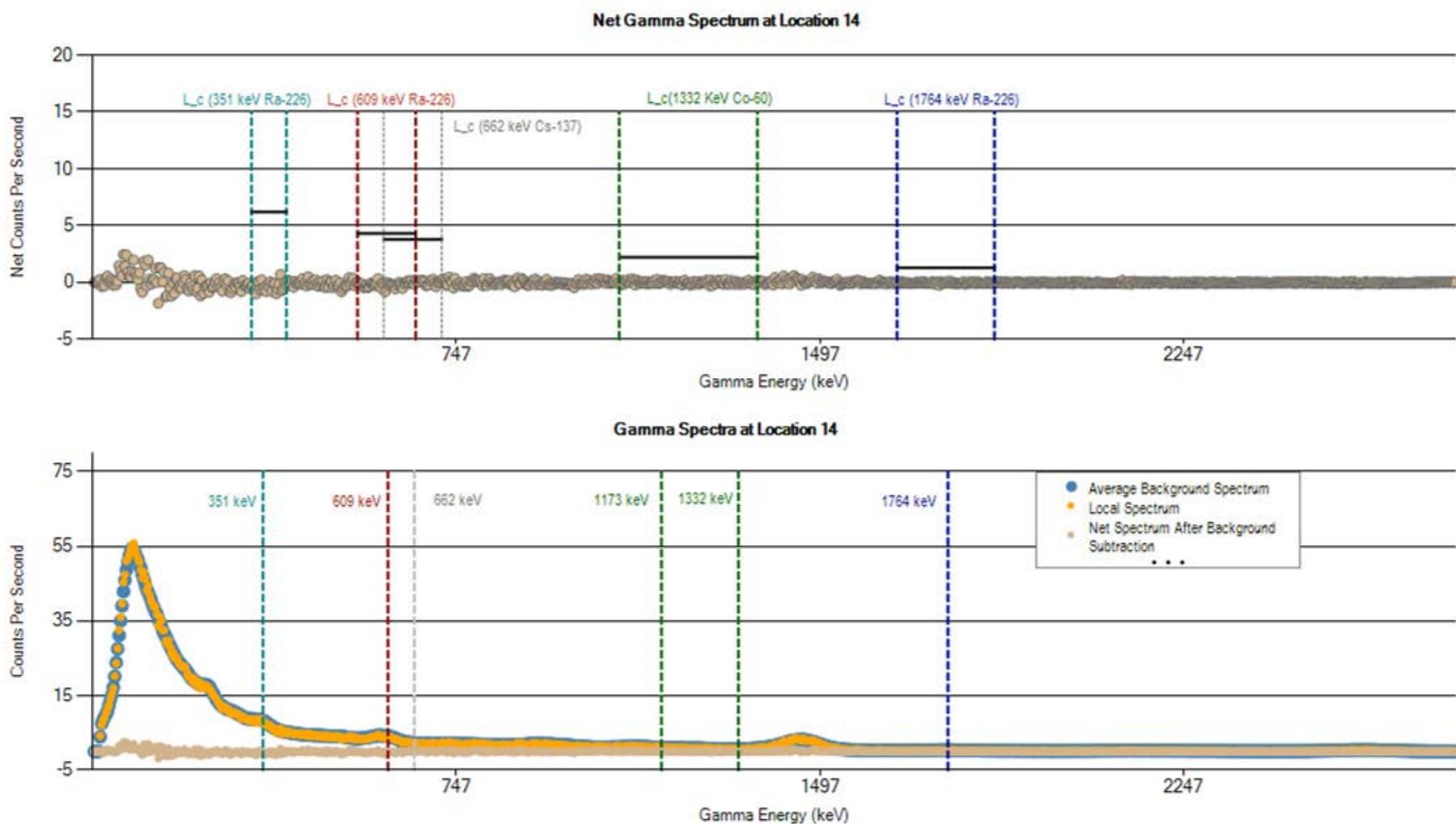
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Location 11 (cps)	898	129	20	23	157	146	113	182	96	3855
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



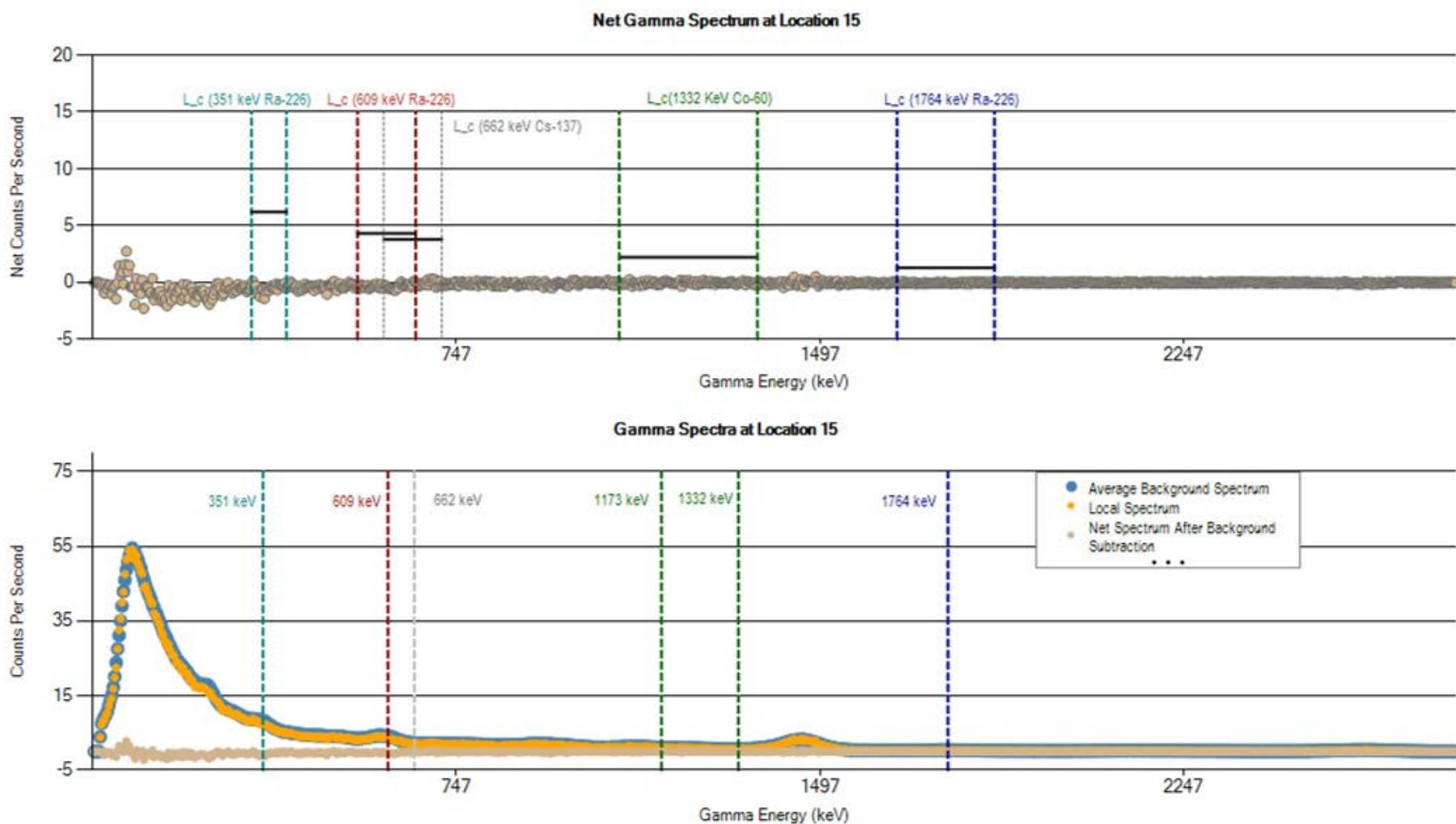
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 12 (cps)	862	124	18	22	151	139	108	176	92	3710
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



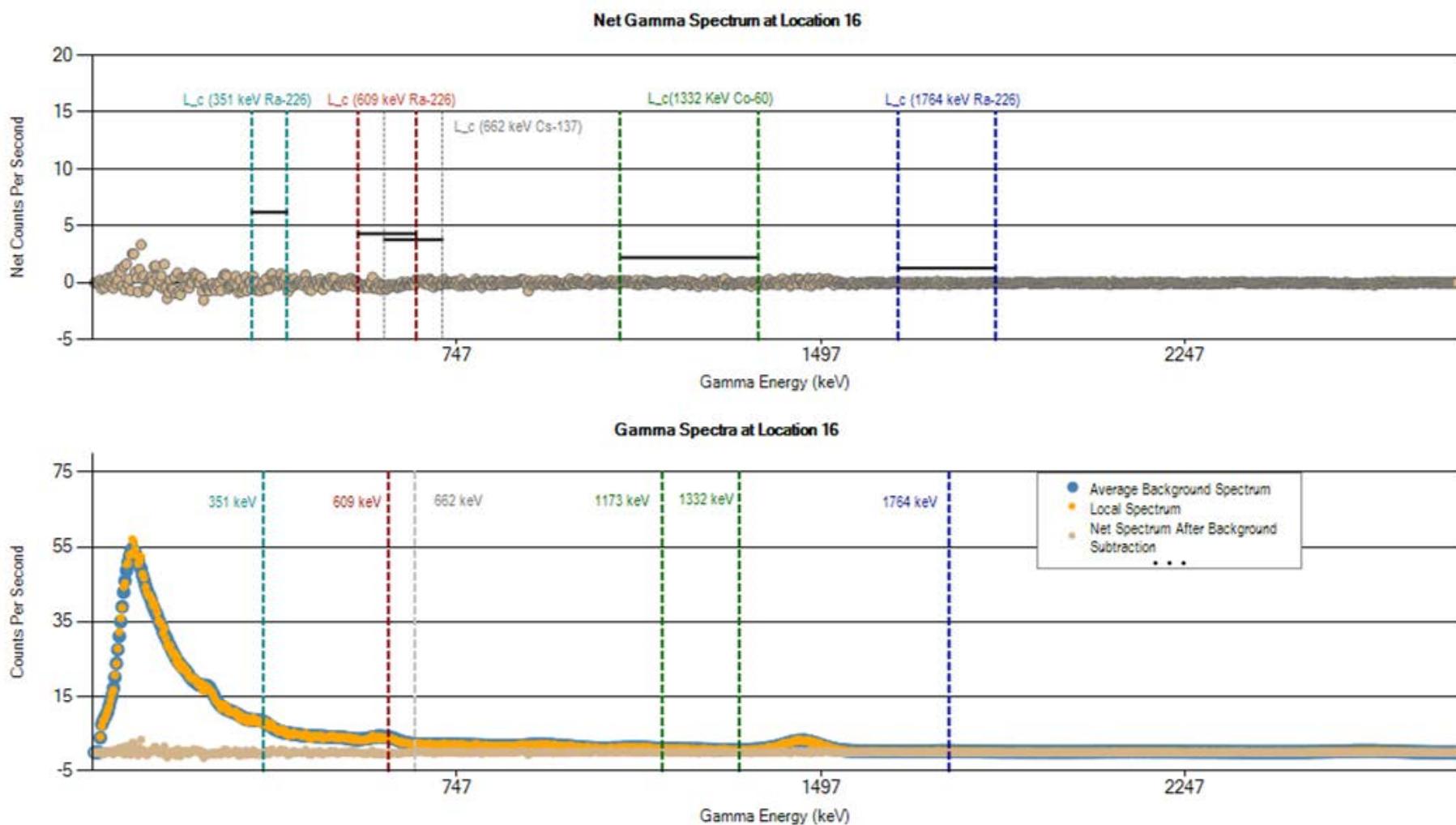
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 13 (cps)	877	125	19	22	155	141	111	179	93	3753
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



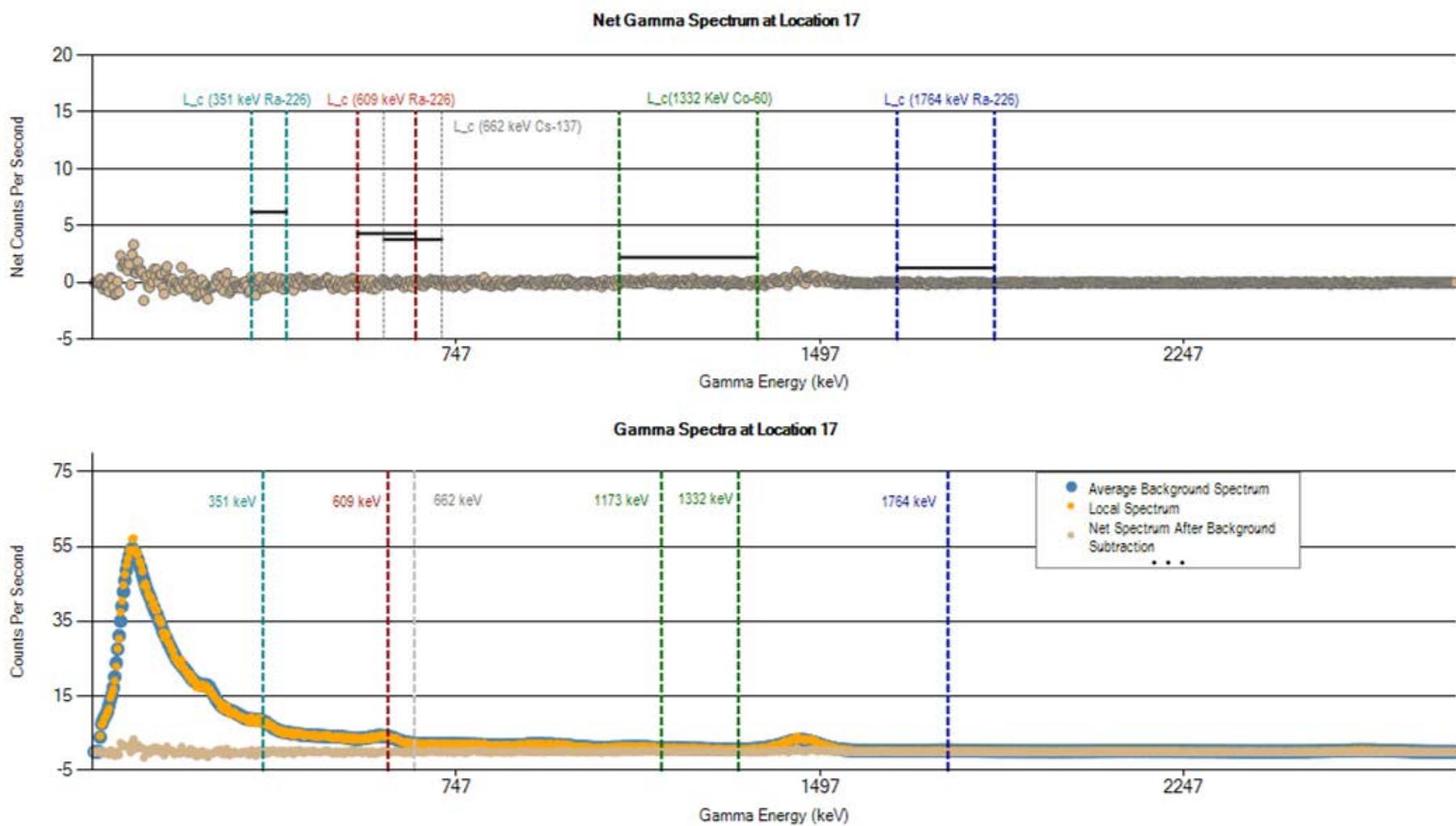
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 14 (cps)	838	120	18	21	145	133	105	166	89	3593
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



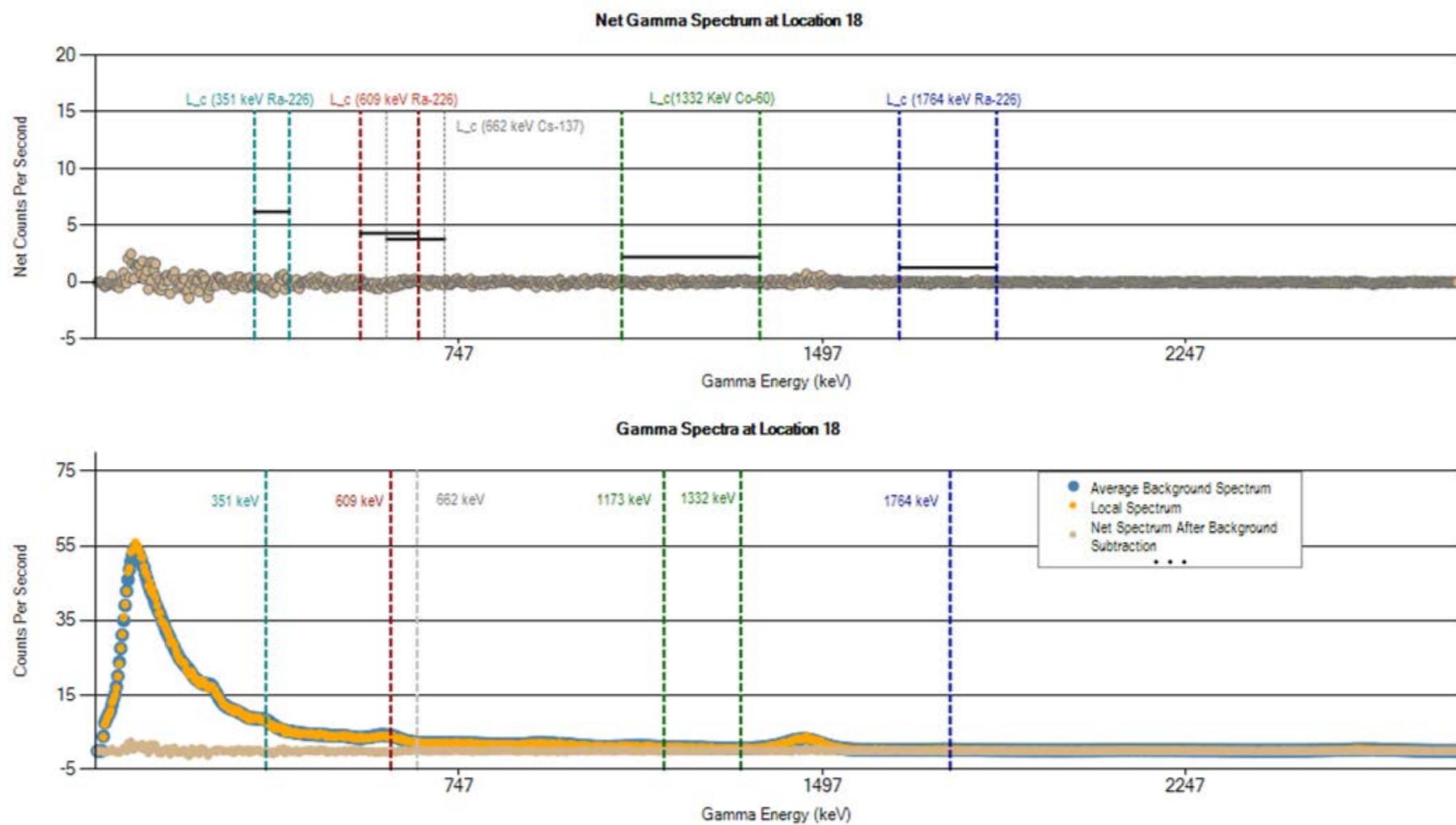
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 15 (cps)	794	112	18	21	139	127	99	162	84	3473
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



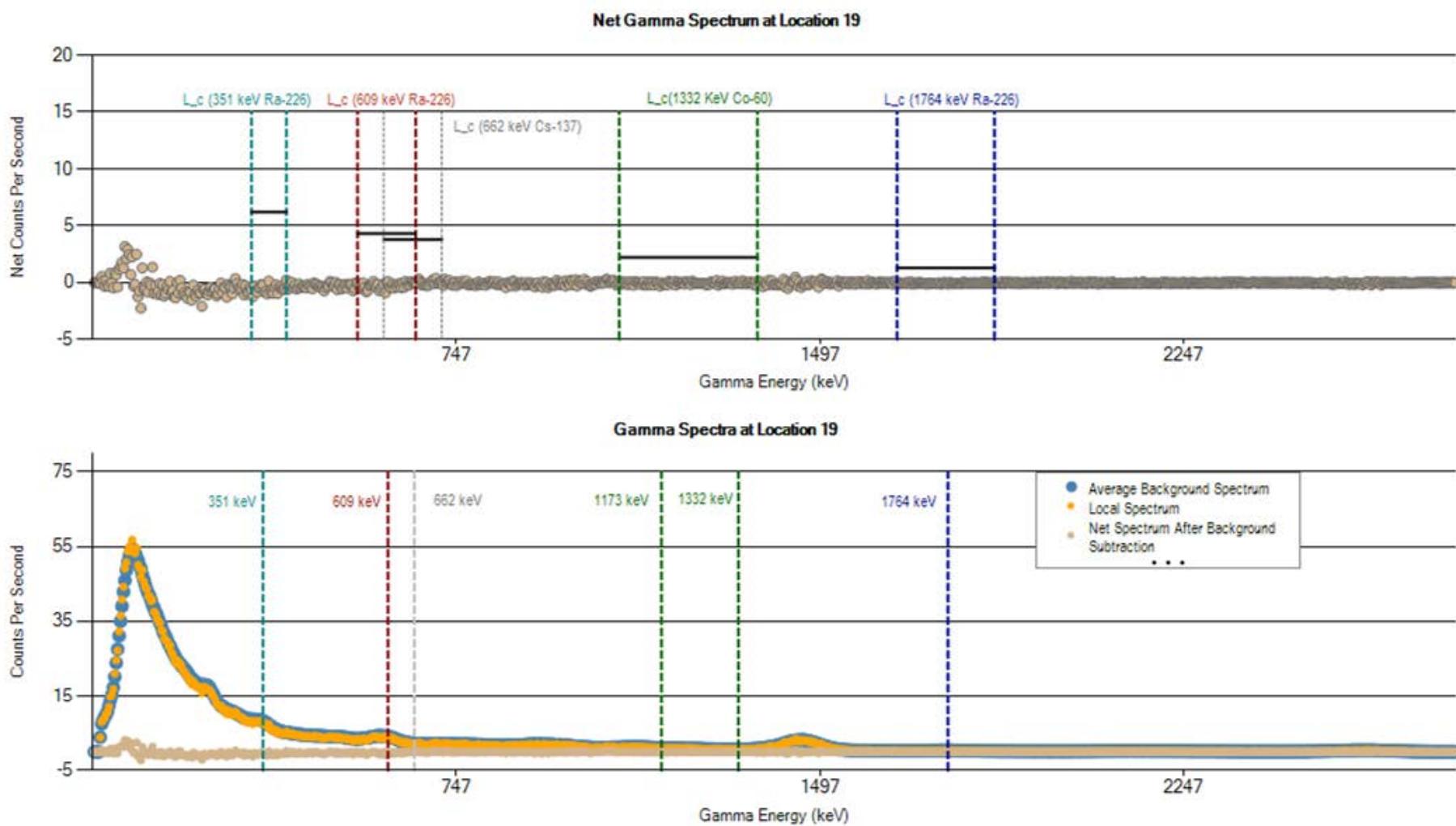
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 16 (cps)	838	118	18	22	149	132	104	174	87	3603
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



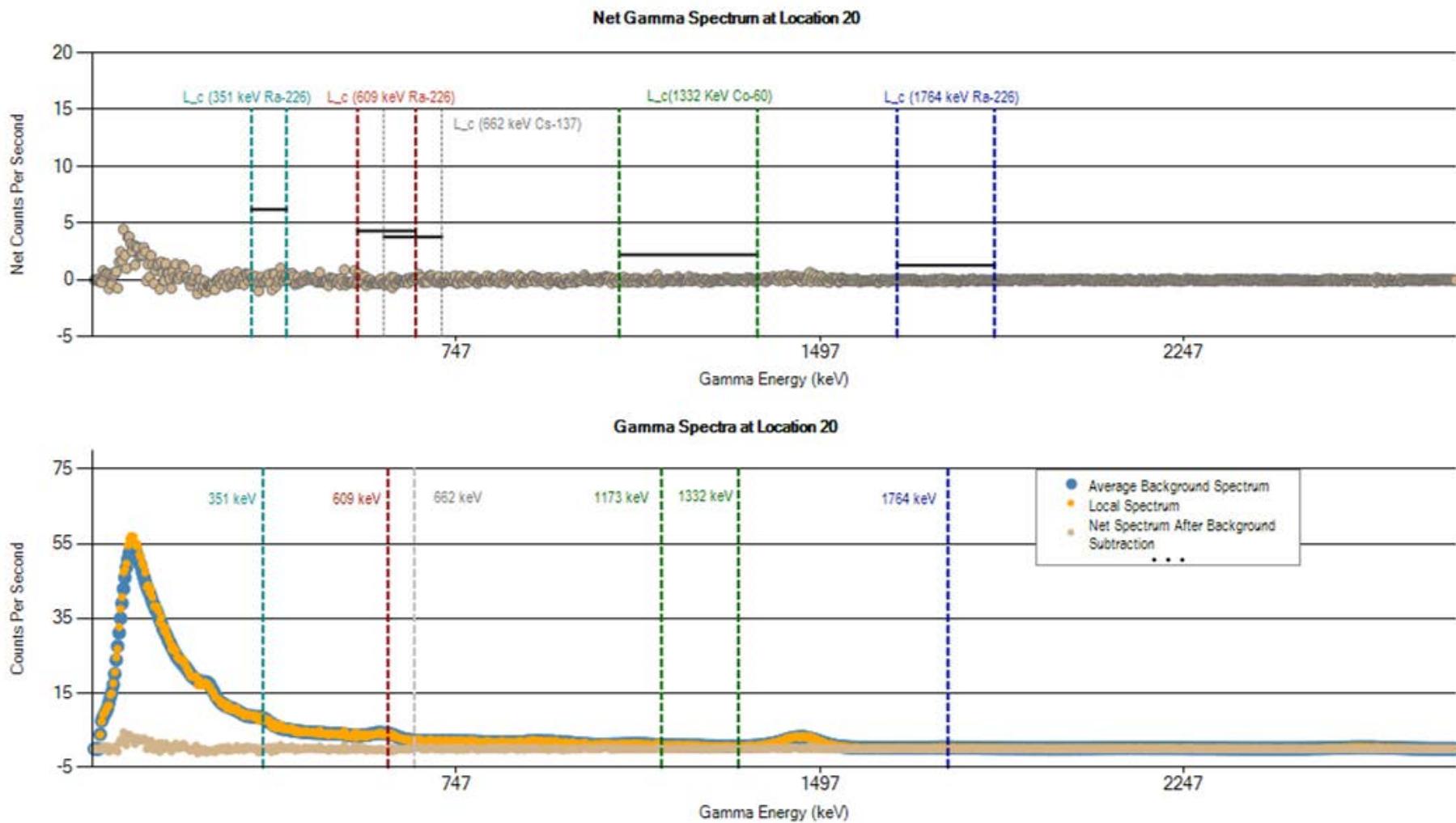
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	853	127	18	22	148	137	107	172	91	3620
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



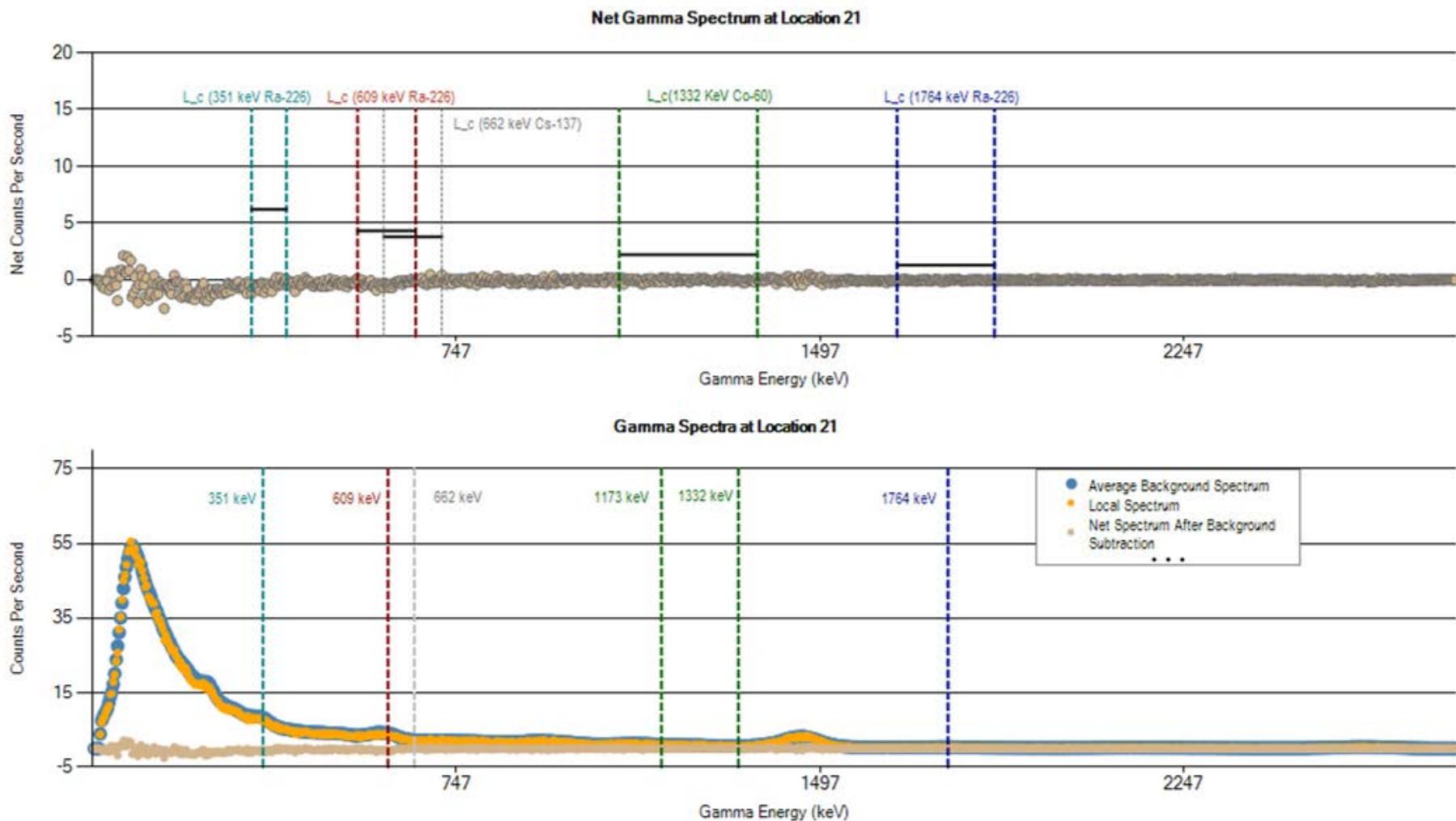
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 18 (cps)	847	119	19	22	149	135	106	172	89	3619
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



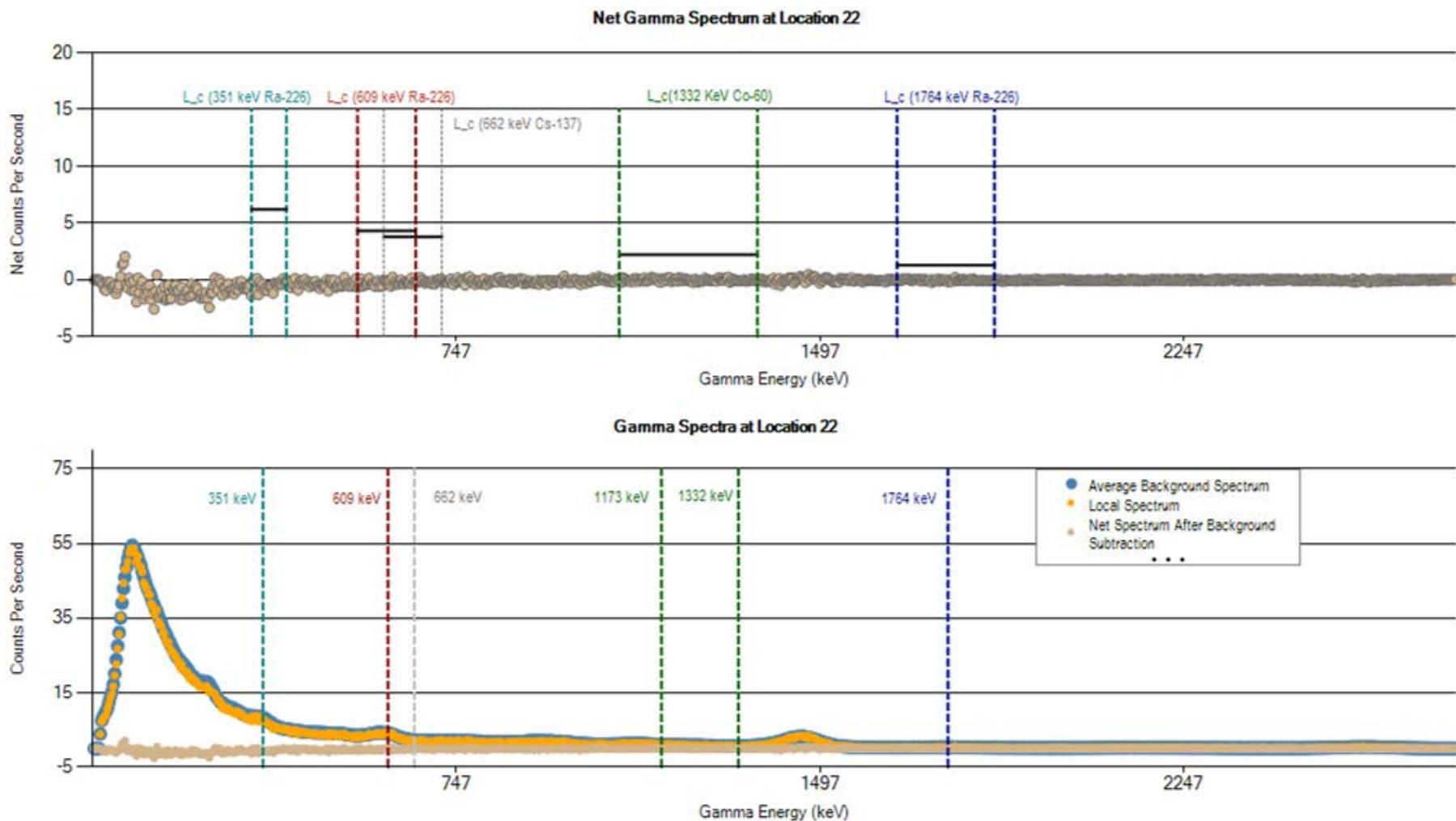
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 19 (cps)	801	112	17	20	139	130	103	161	84	3514
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



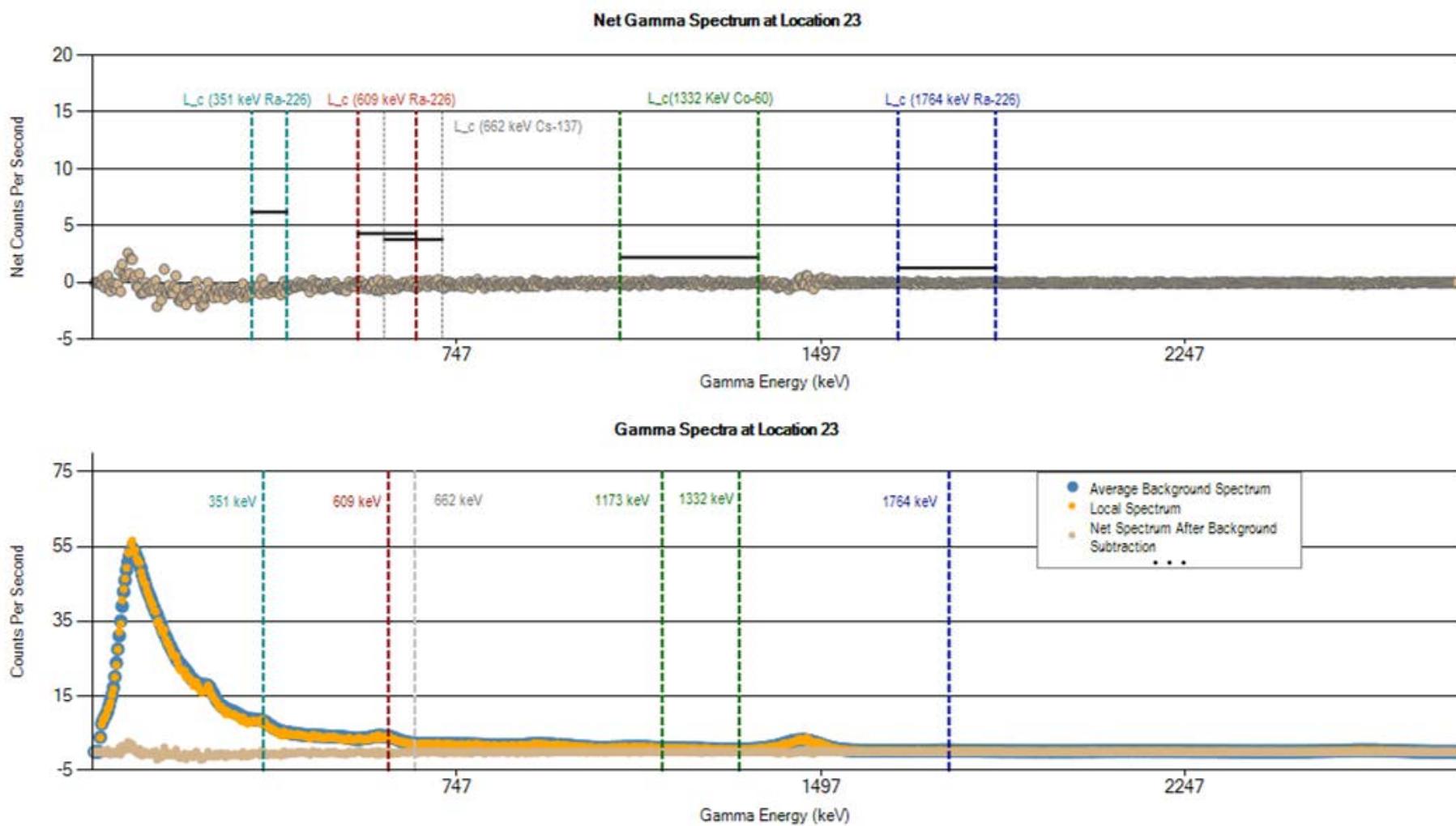
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	848	120	19	22	150	136	106	175	88	3669
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 21 (cps)	801	114	18	20	140	127	100	163	86	3484
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 22 (cps)	801	115	18	20	137	130	100	163	88	3460
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 23 (cps)	795	112	18	21	140	129	100	161	84	3483
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

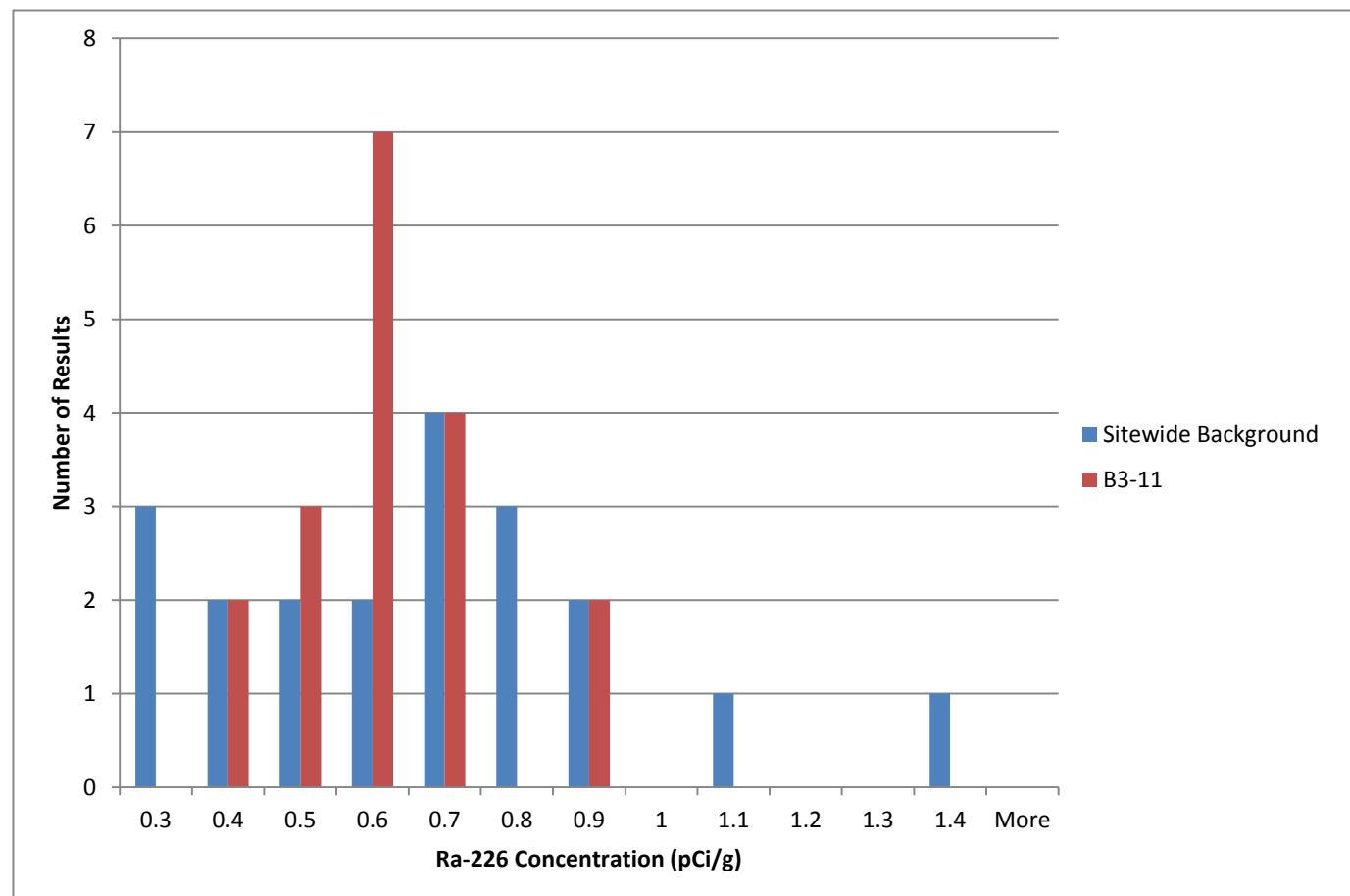
Histogram, RSY B3 (Use 11) vs. Sitewide Background

Background

Bin	Frequency
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

B3-11

Bin	Frequency
0.3	0
0.4	2
0.5	3
0.6	7
0.7	4
0.8	0
0.9	2
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



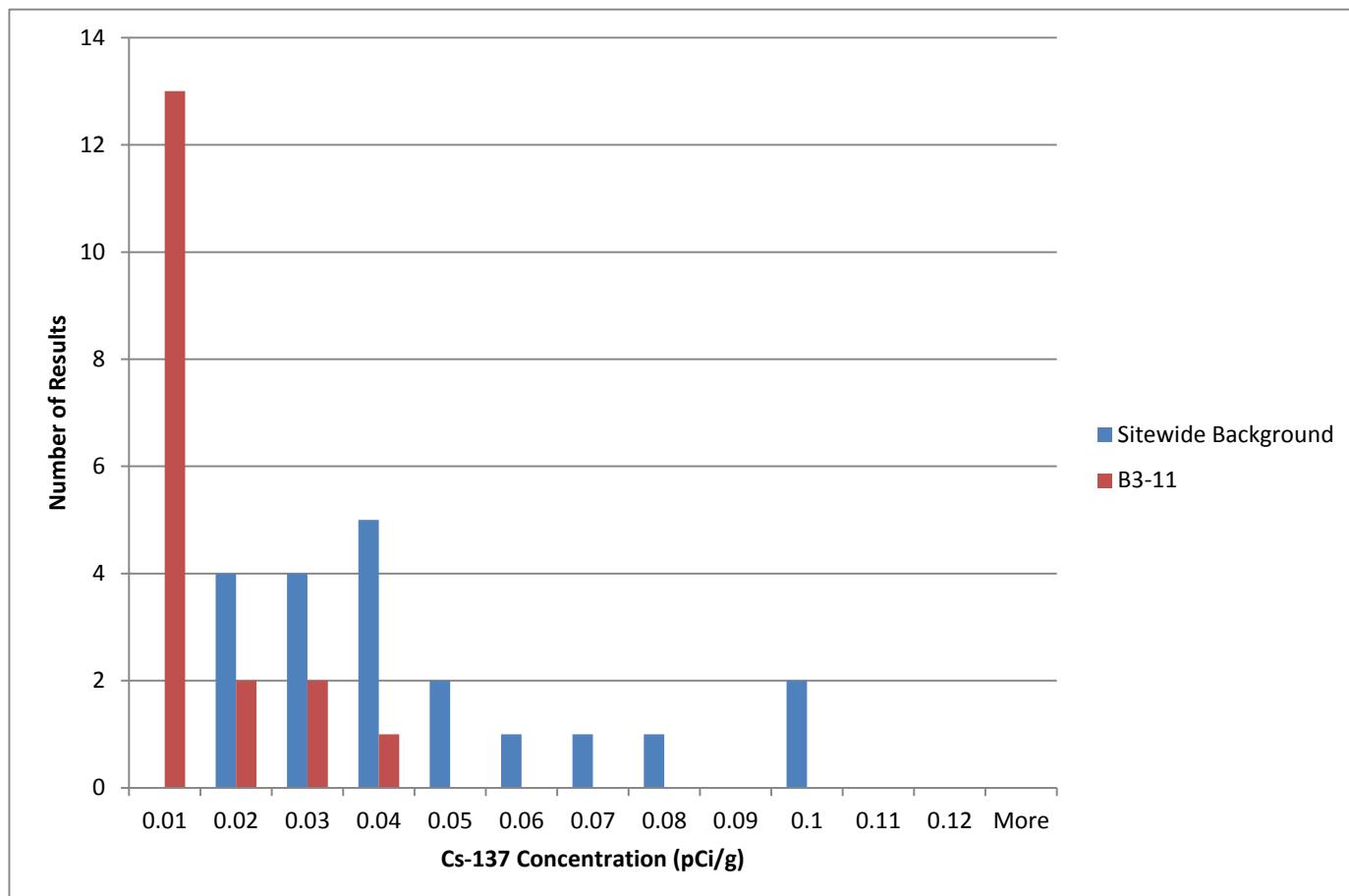
Histogram, RSY B3 (Use 11) vs. Sitewide Background

Background

Bin	Frequency
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

B3-11

Bin	Frequency
0.01	13
0.02	2
0.03	2
0.04	1
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



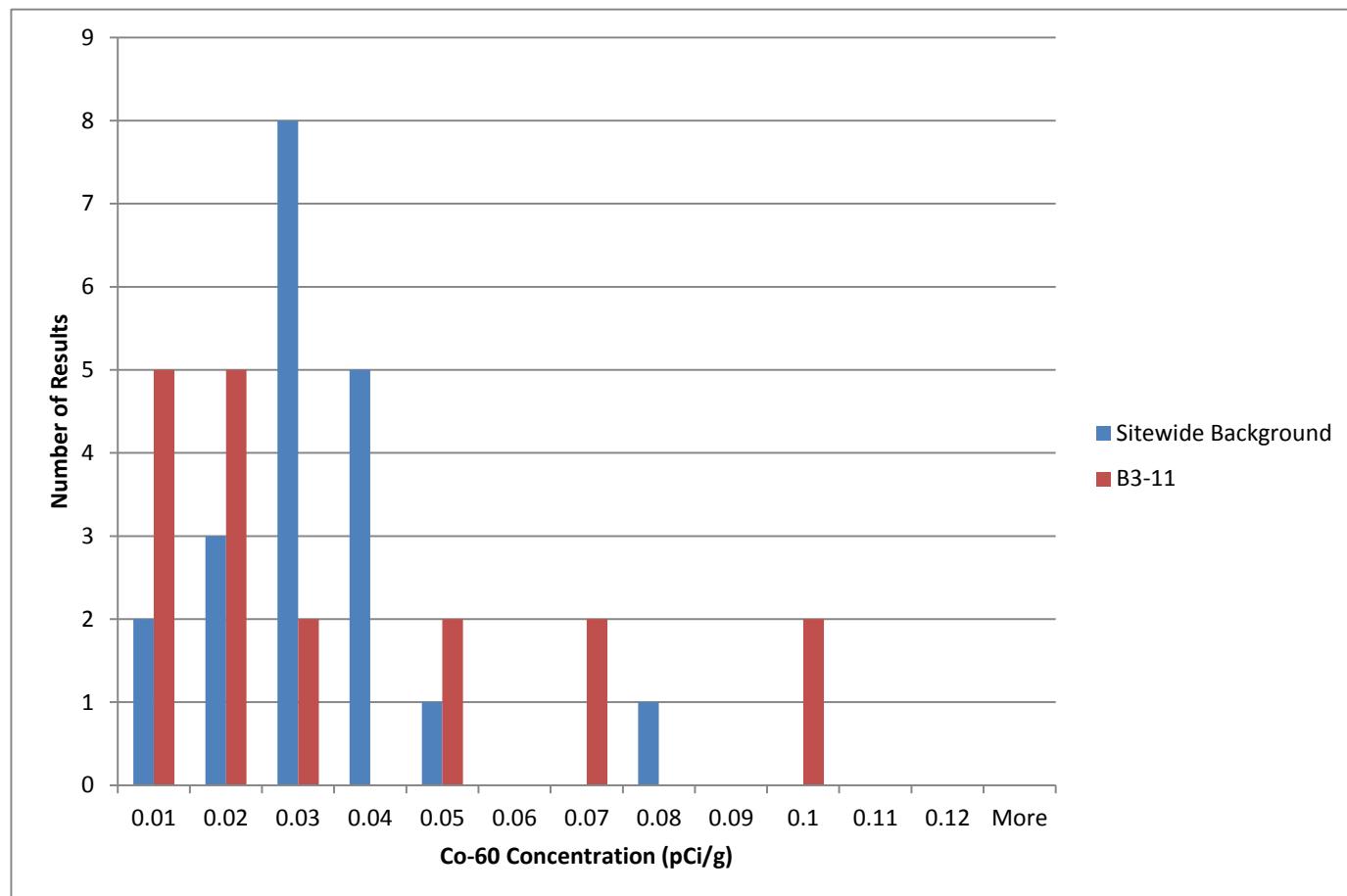
Histogram, RSY B3 (Use 11) vs. Sitewide Background

Background

<i>Bin</i>	<i>Frequency</i>
0.01	2
0.02	3
0.03	8
0.04	5
0.05	1
0.06	0
0.07	0
0.08	1
0.09	0
0.1	0
0.11	0
0.12	0
More	0

B3-11

<i>Bin</i>	<i>Frequency</i>
0.01	5
0.02	5
0.03	2
0.04	0
0.05	2
0.06	0
0.07	2
0.08	0
0.09	0
0.1	2
0.11	0
0.12	0
More	0





ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29717-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:

8/20/2018 9:15:47 PM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566

rhonda.ridenhower@testamericainc.com

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results through

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Expert

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www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

Client: Optim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Job ID: 160-29717-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Optim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29717-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup

Method 3620C: Florisil Cleanup

Method 3630C: Silica Gel Cleanup

Method 3640A: Gel-Permeation Cleanup

Method 3650B: Acid-Base Partition Cleanup

Method 3660B: Sulfur Cleanup

Method 3665A: Sulfuric Acid/Permanganate Cleanup

Case Narrative

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Job ID: 160-29717-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 07/24/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 17.0° C.

TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYB3-U11-S001 (160-29717-1) and PE2-RSYB3-U11-S011 (160-29717-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 07/24/2018, prepared on 07/26/2018 and analyzed on 08/13/2018.

The following samples in batch 160-378105 could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYB3-U11-S001 (160-29717-1) and PE2-RSYB3-U11-S011 (160-29717-11). The samples contained detritus material and rocks of varying sizes.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYB3-U11-S001 (160-29717-1), PE2-RSYB3-U11-S002 (160-29717-2), PE2-RSYB3-U11-S003 (160-29717-3), PE2-RSYB3-U11-S004 (160-29717-4), PE2-RSYB3-U11-S005 (160-29717-5), PE2-RSYB3-U11-S006 (160-29717-6), PE2-RSYB3-U11-S007 (160-29717-7), PE2-RSYB3-U11-S008 (160-29717-8), PE2-RSYB3-U11-S009 (160-29717-9), PE2-RSYB3-U11-S010 (160-29717-10), PE2-RSYB3-U11-S011 (160-29717-11), PE2-RSYB3-U11-S012 (160-29717-12), PE2-RSYB3-U11-S013 (160-29717-13), PE2-RSYB3-U11-S014 (160-29717-14), PE2-RSYB3-U11-S015 (160-29717-15), PE2-RSYB3-U11-S016 (160-29717-16), PE2-RSYB3-U11-S017 (160-29717-17) and PE2-RSYB3-U11-S018 (160-29717-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/24/2018, prepared on 07/25/2018 and analyzed on 08/15/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met for the following samples in batch 160-377925: PE2-RSYB3-U11-S005 (160-29717-5), PE2-RSYB3-U11-S006 (160-29717-6), PE2-RSYB3-U11-S008 (160-29717-8), PE2-RSYB3-U11-S009 (160-29717-9), PE2-RSYB3-U11-S015 (160-29717-15), PE2-RSYB3-U11-S017 (160-29717-17) and PE2-RSYB3-U11-S018 (160-29717-18). This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

CHAIN OF CUSTODY

Ref. Document # PE2_RSYB3 USE11 SH SAND#556

Page 1 of 2

Analyses Requested									
Gamma Spec (EPA 1911.M) - Total Strontium 90 (EPA 905 MOD) Strontium 90 (EPA 905 MOD) Dose Rate $\mu\text{R}/\text{hr}$ <small>(7 day in-growth preliminary results and full 21 day in-growth for full gamma results)</small>									
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566 Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566									
Purchase Order #: 2022296 Waybill Number: 126654513933646666 Shipment/Pickup Date: 7.13.18 Project Location: HPPNS - Parcel E-2 Project Name: Revetment Spills Systematic Project Manager: Nels Johnson <small>(Name & phone #)</small> Send Report To: Eddie Kalombo Phone/Fax Number: 415-987-0760 Address: 4005 Port Chicago Hwy City: Concord, CA, 94520 Sampler's Name(s): <u>Eddie Kalombo</u>									
Collection Information									
Sample ID Number	Sample Description	Date	Time	Method	Matrix	# Containers	Preservative (water)	N/A	N/A
PE2-RSYB3-U11-S001	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0930	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S002	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0931	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S003	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0938	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S004	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0942	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S005	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0948	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S006	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0952	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S007	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	0956	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S008	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1000	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S009	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1004	G	SO	1	16 oz. plastic jar	X	X
PE2-RSYB3-U11-S010	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1008	G	SO	1	16 oz. plastic jar	X	X
Special Instructions: Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g. 7 days ingrown draft and follow with 21 days final.									
Level Of QC Required: <input type="checkbox"/> 24-hr <input type="checkbox"/> 3-day <input type="checkbox"/> 10-day I II III Project Specific:									
Standard TAT -10-day	<u>Eddie Kalombo</u>	Date: 7/16/18 Time: 1100	Received By: <u>Randy E. Kalombo</u>	Date: 7/16/18 Time: 1100	Method Codes: <u>0845</u>	C = Composite	G = Grab		
Relinquished By: <u>Eddie Kalombo</u>	Date: 7/13/18 Time: 1600	Received By: <u>Michael Brown</u>	Date: 7/24/18 Time: 1600	Matrix Codes: <u>DW</u>	DW = Drinking Water	SO = Soil			
Relinquished By: <u>Eddie Kalombo</u>	Date: 7/13/18 Time: 1600	Received By: <u>Michael Brown</u>	Date: 7/24/18 Time: 1600	Matrix Codes: <u>GW</u>	GW = Ground Water	SL = Sludge			
Relinquished By: <u>Eddie Kalombo</u>	Date: 7/13/18 Time: 1600	Received By: <u>Michael Brown</u>	Date: 7/24/18 Time: 1600	Matrix Codes: <u>WW</u>	WW = Waste Water	CP = Chip Samples			
Relinquished By: <u>Eddie Kalombo</u>	Date: 7/13/18 Time: 1600	Received By: <u>Michael Brown</u>	Date: 7/24/18 Time: 1600	Matrix Codes: <u>A</u>	A = Air	AES=Asbestos, PO=Pipe Opening			



CHAIN OF CUSTODY

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Ref. Document # <u>PE2_RSYB3 USE11 SH SAND#556</u>										
Page <u>2</u> of <u>2</u>										
Analyses Requested										
Total Strontium 90 (EPA 905 MOD)										
Gamma Spec (EPA 1911 M) - (7 day in-growth primary results and full 21 day in-growth for full gamma results)										
Dose Rate $\mu\text{R}/\text{Hr}$										
Preservative (water)										
Preservative (soil)										
Sample ID Number	Sample Description	Date	Time	Method	Matrix	# containers	Container Type	N/A	N/A	
PE2-RSYB3-U11-S011	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1013	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S012	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1018	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S013	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1022	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S014	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1026	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S015	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1030	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S016	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1035	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S017	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1040	G	SO	1	16 oz. plastic jar	X	X	
PE2-RSYB3-U11-S018	Parcel E-2 RSYB3 USE 11 Systematic	7/16/18	1044	G	SO	1	16 oz. plastic jar	X	X	
Special Instructions:										
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.										
7 days ingrown draft and follow with 21 days final.										
Level Of QC Required:										
<input type="checkbox"/> 24-hr	<input type="checkbox"/> 3-day	<input checked="" type="checkbox"/> 10-day	I	II	III	Project Specific:				
Standard TAT -10-day										
Relinquished By: <u>JOAQUIN RAMIREZ</u>	Date: <u>7/16/2018</u>	Time: <u>1100</u>	Received By: <u>KODIE KAHOMBO</u>	Date: <u>7/16/18</u>	Time: <u>1100</u>	Method Codes: C = Composite G = Grab				
Relinquished By: <u>EDDIE KAHOMBO</u>	Date: <u>7/13/18</u>	Time: <u>1600</u>	Received By: <u>Andrea Thompson</u>	Date: <u>7-24-18</u>	Time: <u>0845</u>	Matrix Codes: DW = Drinking Water SL = Sludge WW = Ground Water CP = Chip Samples ABS=Asbestos, PC=Pipe Opening				
Relinquished By:	Date:	Time:	Received By:	Date:	Time:					
Relinquished By:	Date:	Time:	Received By:	Date:	Time:					

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29717-2

Login Number: 29717**List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation **These commonly used abbreviations may or may not be present in this report.**

□	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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Sample Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29717-1	PE2-RSYB3-U11-S001	Solid	07/16/18 09:30	07/24/18 08:45
160-29717-2	PE2-RSYB3-U11-S002	Solid	07/16/18 09:34	07/24/18 08:45
160-29717-3	PE2-RSYB3-U11-S003	Solid	07/16/18 09:38	07/24/18 08:45
160-29717-4	PE2-RSYB3-U11-S004	Solid	07/16/18 09:42	07/24/18 08:45
160-29717-5	PE2-RSYB3-U11-S005	Solid	07/16/18 09:48	07/24/18 08:45
160-29717-6	PE2-RSYB3-U11-S006	Solid	07/16/18 09:52	07/24/18 08:45
160-29717-7	PE2-RSYB3-U11-S007	Solid	07/16/18 09:56	07/24/18 08:45
160-29717-8	PE2-RSYB3-U11-S008	Solid	07/16/18 10:00	07/24/18 08:45
160-29717-9	PE2-RSYB3-U11-S009	Solid	07/16/18 10:04	07/24/18 08:45
160-29717-10	PE2-RSYB3-U11-S010	Solid	07/16/18 10:08	07/24/18 08:45
160-29717-11	PE2-RSYB3-U11-S011	Solid	07/16/18 10:13	07/24/18 08:45
160-29717-12	PE2-RSYB3-U11-S012	Solid	07/16/18 10:18	07/24/18 08:45
160-29717-13	PE2-RSYB3-U11-S013	Solid	07/16/18 10:22	07/24/18 08:45
160-29717-14	PE2-RSYB3-U11-S014	Solid	07/16/18 10:26	07/24/18 08:45
160-29717-15	PE2-RSYB3-U11-S015	Solid	07/16/18 10:30	07/24/18 08:45
160-29717-16	PE2-RSYB3-U11-S016	Solid	07/16/18 10:35	07/24/18 08:45
160-29717-17	PE2-RSYB3-U11-S017	Solid	07/16/18 10:40	07/24/18 08:45
160-29717-18	PE2-RSYB3-U11-S018	Solid	07/16/18 10:44	07/24/18 08:45

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S001**Lab Sample ID: 160-29717-1**

Date Collected: 07/16/18 09:30

Matrix: Solid

Date Received: 07/24/18 08:45

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	0.0679		0.0650	0.0651	0.331	0.0477	pCi/g	07/26/18 08:49	08/13/18 06:41	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	87.5		40 - 110					07/26/18 08:49	08/13/18 06:41	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.603		0.424	0.428		0.195	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Actinium-227	0.214	U	0.753	0.753		0.509	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Bismuth-212	-0.414	U	1.50	1.50		1.20	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Bismuth-214	0.704		0.232	0.243		0.0838	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Cesium-137	0.00173	U	0.0627	0.0627	0.0700	0.0409	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Cobalt-60	0.0326		0.0609	0.0610	0.200	0.0208	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Lead-210	2.76		1.63	1.66		1.00	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Lead-212	0.666		0.135	0.161		0.0594	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Lead-214	0.696		0.160	0.175		0.0497	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Potassium-40	8.91		2.15	2.33		0.647	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Protactinium-231	0.697	U	2.48	2.49		2.72	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Radium-226	0.704		0.232	0.243	0.700	0.0838	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Radium-228	0.603		0.424	0.428		0.195	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Thallium-208	0.301		0.0797	0.0856		0.0123	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Thorium-228	0.666		0.135	0.161		0.0594	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Thorium-232	0.603		0.424	0.428		0.195	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Thorium-234	0.0288	U	1.49	1.49		1.22	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Uranium-235	0.0844	U	0.272	0.272		0.394	pCi/g	07/25/18 12:46	08/15/18 08:49	1
Uranium-238	0.0288	U	1.49	1.49		1.22	pCi/g	07/25/18 12:46	08/15/18 08:49	1

Client Sample ID: PE2-RSYB3-U11-S002**Lab Sample ID: 160-29717-2**

Date Collected: 07/16/18 09:34

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.541		0.443	0.446		0.210	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Actinium-227	-0.491	U	1.24	1.24		1.00	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Bismuth-212	-0.0180	U	0.950	0.950		0.776	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Bismuth-214	0.716		0.206	0.218		0.0832	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Cesium-137	0.0246	U	0.0713	0.0713	0.0700	0.0559	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Cobalt-60	0.0219	U	0.0823	0.0823	0.200	0.0394	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Lead-210	1.70		2.21	2.22		1.35	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Lead-212	0.694		0.138	0.156		0.0691	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Lead-214	0.652		0.143	0.157		0.0698	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Potassium-40	12.5		1.96	2.34		0.465	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Protactinium-231	-1.30	U	4.19	4.19		3.41	pCi/g	07/25/18 12:46	08/15/18 01:33	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S002**Lab Sample ID: 160-29717-2**

Date Collected: 07/16/18 09:34

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Radium-226	0.716		0.206	0.218	0.700	0.0832	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Radium-228	0.541		0.443	0.446		0.210	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Thallium-208	0.207		0.0898	0.0922		0.0404	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Thorium-228	0.694		0.138	0.156		0.0691	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Thorium-232	0.541		0.443	0.446		0.210	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Thorium-234	-0.149 U		1.64	1.64		1.35	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Uranium-235	0.204 U		0.827	0.827		0.676	pCi/g	07/25/18 12:46	08/15/18 01:33	1
Uranium-238	-0.149 U		1.64	1.64		1.35	pCi/g	07/25/18 12:46	08/15/18 01:33	1

Client Sample ID: PE2-RSYB3-U11-S003**Lab Sample ID: 160-29717-3**

Date Collected: 07/16/18 09:38

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.502		0.192	0.199		0.198	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Actinium-227	0.299 U		0.551	0.551		0.714	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Bismuth-212	-0.176 U		0.708	0.709		0.931	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Bismuth-214	0.465		0.174	0.180		0.0810	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Cesium-137	0.0202 U		0.0550	0.0550	0.0700	0.0421	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Cobalt-60	0.0505		0.0360	0.0363	0.200	0.0442	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Lead-210	1.47		1.99	2.00		1.19	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Lead-212	0.623		0.121	0.145		0.0504	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Lead-214	0.580		0.151	0.163		0.0795	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Potassium-40	11.1		1.91	2.23		0.358	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Protactinium-231	-1.01 U		3.52	3.53		2.87	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Radium-226	0.465		0.174	0.180	0.700	0.0810	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Radium-228	0.502		0.192	0.199		0.198	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Thallium-208	0.169		0.104	0.105		0.0514	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Thorium-228	0.623		0.121	0.145		0.0504	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Thorium-232	0.502		0.192	0.199		0.198	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Thorium-234	-1.66 U		1.58	1.59		1.76	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Uranium-235	0.0862 U		0.257	0.258		0.587	pCi/g	07/25/18 12:46	08/15/18 01:32	1
Uranium-238	-1.66 U		1.58	1.59		1.76	pCi/g	07/25/18 12:46	08/15/18 01:32	1

Client Sample ID: PE2-RSYB3-U11-S004**Lab Sample ID: 160-29717-4**

Date Collected: 07/16/18 09:42

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.817		0.233	0.248		0.0388	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Actinium-227	0.0838 U		1.05	1.05		0.859	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Bismuth-212	0.000 U		0.769	0.769		0.791	pCi/g	07/25/18 12:46	08/15/18 06:10	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S004**Lab Sample ID: 160-29717-4**

Date Collected: 07/16/18 09:42

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.697		0.148	0.164		0.0182	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Cesium-137	-0.00375	U	0.0766	0.0766	0.0700	0.0628	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Cobalt-60	0.0227	U	0.0562	0.0563	0.200	0.0356	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Lead-210	1.19	U	1.88	1.88		1.29	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Lead-212	0.671		0.129	0.146		0.0604	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Lead-214	0.682		0.167	0.181		0.0764	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Potassium-40	13.4		1.86	2.30		0.151	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Protactinium-231	-1.17	U	4.32	4.32		3.52	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Radium-226	0.697		0.148	0.164	0.700	0.0182	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Radium-228	0.817		0.233	0.248		0.0388	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thallium-208	0.256		0.0956	0.0991		0.0399	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thorium-228	0.671		0.129	0.146		0.0604	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thorium-232	0.817		0.233	0.248		0.0388	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thorium-234	1.41		1.59	1.60		1.00	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Uranium-235	0.159	U	0.335	0.335		0.717	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Uranium-238	1.41		1.59	1.60		1.00	pCi/g	07/25/18 12:46	08/15/18 06:10	1

Client Sample ID: PE2-RSYB3-U11-S005**Lab Sample ID: 160-29717-5**

Date Collected: 07/16/18 09:48

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.673		0.184	0.197		0.0422	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Actinium-227	0.286	U	0.470	0.471		0.506	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Bismuth-212	-0.309	U	0.896	0.896		0.879	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Bismuth-214	0.609		0.172	0.184		0.0667	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Cesium-137	-0.0515	U	0.0998	0.0999	0.0700	0.0803	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Cobalt-60	0.0311	U	0.111	0.111	0.200	0.0546	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Lead-210	-0.849	U	1.98	1.98		1.43	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Lead-212	0.553		0.135	0.153		0.0778	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Lead-214	0.713		0.159	0.176		0.0573	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Potassium-40	10.8		1.81	2.12		0.327	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Protactinium-231	0.000	U	0.712	0.712		2.56	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Radium-226	0.609		0.172	0.184	0.700	0.0667	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Radium-228	0.673		0.184	0.197		0.0422	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thallium-208	0.265		0.0769	0.0816		0.0273	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thorium-228	0.553		0.135	0.153		0.0778	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thorium-232	0.673		0.184	0.197		0.0422	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thorium-234	0.228	U	1.72	1.72		1.41	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Uranium-235	0.138	U	0.414	0.414		0.334	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Uranium-238	0.228	U	1.72	1.72		1.41	pCi/g	07/25/18 12:46	08/15/18 06:09	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S006

Date Collected: 07/16/18 09:52

Date Received: 07/24/18 08:45

Lab Sample ID: 160-29717-6

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.835		0.300	0.312		0.141	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Actinium-227	-0.553	U		1.21	1.21	0.972	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Bismuth-212	-0.696	U	0.945	0.947		1.00	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Bismuth-214	0.599		0.176	0.186		0.0643	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Cesium-137	-0.0122	U	0.0751	0.0751	0.0700	0.0806	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Cobalt-60	0.0683		0.0381	0.0387	0.200	0.0446	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Lead-210	-2.15	U	2.29	2.30		1.82	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Lead-212	0.653		0.132	0.157		0.0629	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Lead-214	0.425		0.152	0.158		0.0657	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Potassium-40	12.6		2.04	2.42		0.361	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Protactinium-231	0.000	U	1.24	1.24		3.33	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Radium-226	0.599		0.176	0.186	0.700	0.0643	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Radium-228	0.835		0.300	0.312		0.141	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thallium-208	0.232		0.0833	0.0867		0.0319	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thorium-228	0.653		0.132	0.157		0.0629	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thorium-232	0.835		0.300	0.312		0.141	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Thorium-234	-0.583	U	1.92	1.92		1.60	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Uranium-235	-0.0251	U	0.606	0.606		0.623	pCi/g	07/25/18 12:46	08/15/18 06:10	1
Uranium-238	-0.583	U	1.92	1.92		1.60	pCi/g	07/25/18 12:46	08/15/18 06:10	1

Client Sample ID: PE2-RSYB3-U11-S007

Date Collected: 07/16/18 09:56

Date Received: 07/24/18 08:45

Lab Sample ID: 160-29717-7

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.815		0.228	0.243		0.0336	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Actinium-227	0.0170	U	0.0342	0.0343		0.574	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Bismuth-212	0.515	U	1.16	1.16		0.921	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Bismuth-214	0.589		0.161	0.173		0.0648	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Cesium-137	-0.0341	U	0.0717	0.0718	0.0700	0.0560	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Cobalt-60	0.0245	U	0.0528	0.0528	0.200	0.0306	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Lead-210	-0.783	U	1.84	1.85		1.35	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Lead-212	0.545		0.112	0.133		0.0555	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Lead-214	0.581		0.143	0.155		0.0551	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Potassium-40	10.9		1.62	1.97		0.351	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Protactinium-231	0.000	U	0.687	0.687		2.51	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Radium-226	0.589		0.161	0.173	0.700	0.0648	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Radium-228	0.815		0.228	0.243		0.0336	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thallium-208	0.174		0.0609	0.0635		0.0247	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thorium-228	0.545		0.112	0.133		0.0555	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thorium-232	0.815		0.228	0.243		0.0336	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thorium-234	2.34		0.997	1.03		0.651	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Uranium-235	0.0520	U	0.123	0.123		0.358	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Uranium-238	2.34		0.997	1.03		0.651	pCi/g	07/25/18 12:46	08/15/18 06:11	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S008

Date Collected: 07/16/18 10:00

Date Received: 07/24/18 08:45

Lab Sample ID: 160-29717-8

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.639		0.226	0.235		0.0484	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Actinium-227	0.243	U	1.27	1.27		1.04	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Bismuth-212	-0.0658	U	1.15	1.15		0.970	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Bismuth-214	0.872		0.233	0.249		0.0881	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Cesium-137	0.0391	U	0.0954	0.0955	0.0700	0.0747	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Cobalt-60	0.0950		0.0564	0.0572	0.200	0.0187	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Lead-210	-1.88	U	2.79	2.80		2.37	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Lead-212	0.704		0.163	0.179		0.0918	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Lead-214	0.738		0.186	0.201		0.0924	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Potassium-40	13.1		2.17	2.54		0.536	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Protactinium-231	-1.58	U	5.40	5.40		4.40	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Radium-226	0.872		0.233	0.249	0.700	0.0881	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Radium-228	0.639		0.226	0.235		0.0484	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thallium-208	0.272		0.119	0.122		0.0559	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thorium-228	0.704		0.163	0.179		0.0918	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thorium-232	0.639		0.226	0.235		0.0484	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Thorium-234	-0.0794	U	2.09	2.09		1.71	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Uranium-235	-0.145	U	0.424	0.424		0.741	pCi/g	07/25/18 12:46	08/15/18 06:09	1
Uranium-238	-0.0794	U	2.09	2.09		1.71	pCi/g	07/25/18 12:46	08/15/18 06:09	1

Client Sample ID: PE2-RSYB3-U11-S009

Date Collected: 07/16/18 10:04

Date Received: 07/24/18 08:45

Lab Sample ID: 160-29717-9

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.336		0.349	0.350		0.203	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Actinium-227	0.322	U	0.674	0.675		0.741	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Bismuth-212	0.0266	U	1.05	1.05		0.861	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Bismuth-214	0.632		0.168	0.180		0.0536	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Cesium-137	0.0326	U	0.108	0.108	0.0700	0.0866	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Cobalt-60	-0.0737	U	0.115	0.116	0.200	0.0739	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Lead-210	0.529	U	1.68	1.68		1.35	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Lead-212	0.686		0.126	0.154		0.0552	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Lead-214	0.557		0.135	0.147		0.0555	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Potassium-40	9.79		1.75	2.01		0.335	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Protactinium-231	0.000	U	0.860	0.860		2.71	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Radium-226	0.632		0.168	0.180	0.700	0.0536	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Radium-228	0.336		0.349	0.350		0.203	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Thallium-208	0.259		0.0886	0.0926		0.0299	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Thorium-228	0.686		0.126	0.154		0.0552	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Thorium-232	0.336		0.349	0.350		0.203	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Thorium-234	-0.306	U	1.79	1.79		1.48	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Uranium-235	-0.323	U	0.556	0.557		0.597	pCi/g	07/25/18 12:46	08/15/18 06:07	1
Uranium-238	-0.306	U	1.79	1.79		1.48	pCi/g	07/25/18 12:46	08/15/18 06:07	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S010**Lab Sample ID: 160-29717-10**

Date Collected: 07/16/18 10:08

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.446		0.335	0.338		0.155	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Actinium-227	-0.346	U	0.831	0.831		0.532	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Bismuth-212	0.492	U	0.817	0.818		0.625	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Bismuth-214	0.449		0.127	0.135		0.0403	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Cesium-137	-0.0471	U	0.0794	0.0796	0.0700	0.0616	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Cobalt-60	0.0468		0.0352	0.0355	0.200	0.0142	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Lead-210	-0.0453	U	1.63	1.63		1.34	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Lead-212	0.542		0.111	0.132		0.0619	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Lead-214	0.498		0.126	0.136		0.0665	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Potassium-40	12.9		1.82	2.24		0.250	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Protactinium-231	0.707	U	1.80	1.80		1.98	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Radium-226	0.449		0.127	0.135	0.700	0.0403	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Radium-228	0.446		0.335	0.338		0.155	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Thallium-208	0.255		0.0699	0.0747		0.0207	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Thorium-228	0.542		0.111	0.132		0.0619	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Thorium-232	0.446		0.335	0.338		0.155	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Thorium-234	0.00806	U	1.16	1.16		0.950	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Uranium-235	-0.0352	U	0.0539	0.0540		0.399	pCi/g	07/25/18 12:46	08/15/18 06:08	1
Uranium-238	0.00806	U	1.16	1.16		0.950	pCi/g	07/25/18 12:46	08/15/18 06:08	1

Client Sample ID: PE2-RSYB3-U11-S011**Lab Sample ID: 160-29717-11**

Date Collected: 07/16/18 10:13

Matrix: Solid

Date Received: 07/24/18 08:45

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Total Beta Strontium	0.0830		0.0671	0.0674	0.331	0.0484	pCi/g	07/26/18 08:49	08/13/18 06:41	1
Carrier	%Yield	Qualifier	Limits							
Sr Carrier	87.2		40 - 110							

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.746		0.183	0.198		0.0518	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Actinium-227	-0.182	U	0.807	0.807		0.549	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Bismuth-212	0.660	U	1.19	1.19		0.912	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Bismuth-214	0.492		0.154	0.162		0.0414	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Cesium-137	-0.00646	U	0.105	0.105	0.0700	0.0634	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Cobalt-60	0.0148	U	0.0960	0.0960	0.200	0.0478	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Lead-210	0.685	U	1.87	1.87		1.29	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Lead-212	0.673		0.129	0.156		0.0483	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Lead-214	0.580		0.165	0.176		0.0629	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Potassium-40	12.8		2.21	2.56		0.424	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Protactinium-231	0.000	U	0.437	0.437		2.88	pCi/g	07/25/18 12:46	08/15/18 06:11	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S011**Lab Sample ID: 160-29717-11**

Date Collected: 07/16/18 10:13

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Radium-226	0.492		0.154	0.162	0.700	0.0414	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Radium-228	0.746		0.183	0.198		0.0518	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thallium-208	0.152		0.108	0.109		0.0547	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thorium-228	0.673		0.129	0.156		0.0483	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thorium-232	0.746		0.183	0.198		0.0518	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Thorium-234	-0.114 U		1.59	1.59		1.31	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Uranium-235	-0.261 U		0.497	0.498		0.731	pCi/g	07/25/18 12:46	08/15/18 06:11	1
Uranium-238	-0.114 U		1.59	1.59		1.31	pCi/g	07/25/18 12:46	08/15/18 06:11	1

Client Sample ID: PE2-RSYB3-U11-S012**Lab Sample ID: 160-29717-12**

Date Collected: 07/16/18 10:18

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.734		0.192	0.206		0.131	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Actinium-227	0.333 U		0.717	0.718		0.573	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Bismuth-212	0.515 U		0.941	0.942		0.738	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Bismuth-214	0.596		0.160	0.172		0.0610	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Cesium-137	-0.0442 U		0.0720	0.0721	0.0700	0.0558	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Cobalt-60	0.0164 U		0.0579	0.0579	0.200	0.0273	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Lead-210	-0.102 U		1.44	1.44		1.49	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Lead-212	0.647		0.111	0.139		0.0401	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Lead-214	0.813		0.143	0.166		0.0372	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Potassium-40	10.7		1.51	1.87		0.309	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Protactinium-231	0.807 U		2.47	2.47		2.01	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Radium-226	0.596		0.160	0.172	0.700	0.0610	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Radium-228	0.734		0.192	0.206		0.131	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Thallium-208	0.250		0.0623	0.0675		0.0188	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Thorium-228	0.647		0.111	0.139		0.0401	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Thorium-232	0.734		0.192	0.206		0.131	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Thorium-234	0.481 U		1.10	1.10		1.33	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Uranium-235	-0.215 U		0.696	0.697		0.480	pCi/g	07/25/18 12:46	08/15/18 06:48	1
Uranium-238	0.481 U		1.10	1.10		1.33	pCi/g	07/25/18 12:46	08/15/18 06:48	1

Client Sample ID: PE2-RSYB3-U11-S013**Lab Sample ID: 160-29717-13**

Date Collected: 07/16/18 10:22

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.594		0.201	0.209		0.0395	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Actinium-227	-0.422 U		1.17	1.17		0.946	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Bismuth-212	-0.0369 U		1.41	1.41		1.16	pCi/g	07/25/18 12:46	08/15/18 06:50	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S013**Lab Sample ID: 160-29717-13**

Date Collected: 07/16/18 10:22

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.913		0.190	0.212		0.0394	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Cesium-137	0.0130	U	0.0832	0.0832	0.0700	0.0673	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Cobalt-60	-0.0761	U	0.152	0.153	0.200	0.0724	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-210	2.26		1.91	1.93		1.25	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-212	0.601		0.125	0.140		0.0604	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-214	0.666		0.150	0.164		0.0843	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Potassium-40	13.0		1.85	2.27		0.153	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Protactinium-231	0.000	U	0.368	0.368		3.13	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Radium-226	0.913		0.190	0.212	0.700	0.0394	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Radium-228	0.594		0.201	0.209		0.0395	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thallium-208	0.197		0.0768	0.0794		0.0333	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-228	0.601		0.125	0.140		0.0604	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-232	0.594		0.201	0.209		0.0395	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-234	0.921	U	1.32	1.33		1.03	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Uranium-235	-0.247	U	0.854	0.854		0.697	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Uranium-238	0.921	U	1.32	1.33		1.03	pCi/g	07/25/18 12:46	08/15/18 06:50	1

Client Sample ID: PE2-RSYB3-U11-S014**Lab Sample ID: 160-29717-14**

Date Collected: 07/16/18 10:26

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.659		0.249	0.258		0.190	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Actinium-227	-0.149	U	0.906	0.906		0.607	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Bismuth-212	0.322	U	0.999	1.00		0.790	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-214	0.522		0.178	0.186		0.0757	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Cesium-137	-0.00361	U	0.101	0.101	0.0700	0.0607	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Cobalt-60	0.0970		0.0538	0.0547	0.200	0.0174	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-210	-0.264	U	1.91	1.91		1.37	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-212	0.708		0.126	0.156		0.0495	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-214	0.516		0.163	0.172		0.0902	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Potassium-40	12.5		1.99	2.37		0.340	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Protactinium-231	0.362	U	1.51	1.51		2.77	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Radium-226	0.522		0.178	0.186	0.700	0.0757	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Radium-228	0.659		0.249	0.258		0.190	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thallium-208	0.243		0.0837	0.0874		0.0302	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thorium-228	0.708		0.126	0.156		0.0495	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thorium-232	0.659		0.249	0.258		0.190	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thorium-234	1.95		1.35	1.36		0.838	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Uranium-235	0.119	U	0.357	0.357		0.348	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Uranium-238	1.95		1.35	1.36		0.838	pCi/g	07/25/18 12:46	08/15/18 06:49	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S015**Lab Sample ID: 160-29717-15**

Date Collected: 07/16/18 10:30

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	1.01		0.361	0.375		0.111	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Actinium-227	-0.600	U	1.34	1.34		1.08	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Bismuth-212	0.0318	U	1.13	1.13		0.929	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Bismuth-214	0.599		0.183	0.193		0.0706	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Cesium-137	0.0341	U	0.0952	0.0952	0.0700	0.0750	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Cobalt-60	0.0689		0.0439	0.0445	0.200	0.0498	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-210	1.16		1.75	1.75		1.11	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-212	0.696		0.139	0.165		0.0613	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-214	0.605		0.145	0.158		0.0667	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Potassium-40	10.7		2.01	2.29		0.403	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Protactinium-231	-1.13	U	4.24	4.25		3.46	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Radium-226	0.599		0.183	0.193	0.700	0.0706	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Radium-228	1.01		0.361	0.375		0.111	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thallium-208	0.276		0.101	0.105		0.0375	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-228	0.696		0.139	0.165		0.0613	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-232	1.01		0.361	0.375		0.111	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-234	1.03		0.668	0.677		1.01	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Uranium-235	-0.270	U	0.249	0.251		0.584	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Uranium-238	1.03		0.668	0.677		1.01	pCi/g	07/25/18 12:46	08/15/18 06:50	1

Client Sample ID: PE2-RSYB3-U11-S016**Lab Sample ID: 160-29717-16**

Date Collected: 07/16/18 10:35

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.851		0.226	0.242		0.0348	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Actinium-227	0.212	U	0.428	0.429		0.537	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Bismuth-212	-0.363	U	1.15	1.15		0.923	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Bismuth-214	0.721		0.173	0.189		0.0614	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Cesium-137	0.000	U	0.0519	0.0519	0.0700	0.0544	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Cobalt-60	-0.00392	U	0.0334	0.0334	0.200	0.0544	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Lead-210	1.53		1.55	1.56		1.03	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Lead-212	0.804		0.133	0.169		0.0609	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Lead-214	0.629		0.160	0.173		0.0796	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Potassium-40	11.9		1.73	2.11		0.365	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Protactinium-231	0.000	U	0.426	0.426		2.54	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Radium-226	0.721		0.173	0.189	0.700	0.0614	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Radium-228	0.851		0.226	0.242		0.0348	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Thallium-208	0.196		0.0640	0.0672		0.0229	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Thorium-228	0.804		0.133	0.169		0.0609	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Thorium-232	0.851		0.226	0.242		0.0348	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Thorium-234	1.88		1.33	1.35		0.876	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Uranium-235	0.191	U	0.405	0.406		0.341	pCi/g	07/25/18 12:46	08/15/18 06:53	1
Uranium-238	1.88		1.33	1.35		0.876	pCi/g	07/25/18 12:46	08/15/18 06:53	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Client Sample ID: PE2-RSYB3-U11-S017**Lab Sample ID: 160-29717-17**

Date Collected: 07/16/18 10:40

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.819		0.425	0.433		0.180	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Actinium-227	-0.486	U	1.31	1.31		1.06	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Bismuth-212	0.462	U	1.19	1.19		0.936	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Bismuth-214	0.585		0.195	0.204		0.0768	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Cesium-137	-0.00326	U	0.113	0.113	0.0700	0.0930	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Cobalt-60	0.0242	U	0.0912	0.0912	0.200	0.0436	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-210	3.20		2.65	2.68		2.03	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-212	0.744		0.146	0.166		0.0691	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Lead-214	0.707		0.188	0.201		0.0865	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Potassium-40	13.5		2.15	2.54		0.515	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Protactinium-231	0.000	U	1.01	1.01		3.46	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Radium-226	0.585		0.195	0.204	0.700	0.0768	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Radium-228	0.819		0.425	0.433		0.180	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thallium-208	0.268		0.0957	0.0995		0.0355	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thorium-228	0.744		0.146	0.166		0.0691	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thorium-232	0.819		0.425	0.433		0.180	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Thorium-234	-0.933	U	2.29	2.29		1.91	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Uranium-235	0.350	U	0.531	0.533		0.589	pCi/g	07/25/18 12:46	08/15/18 06:49	1
Uranium-238	-0.933	U	2.29	2.29		1.91	pCi/g	07/25/18 12:46	08/15/18 06:49	1

Client Sample ID: PE2-RSYB3-U11-S018**Lab Sample ID: 160-29717-18**

Date Collected: 07/16/18 10:44

Matrix: Solid

Date Received: 07/24/18 08:45

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.480		0.348	0.352		0.161	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Actinium-227	-0.570	U	1.19	1.19		0.958	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Bismuth-212	0.0273	U	0.965	0.965		0.792	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Bismuth-214	0.402		0.136	0.142		0.0537	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Cesium-137	-0.0799	U	0.0923	0.0927	0.0700	0.0773	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Cobalt-60	-0.0359	U	0.117	0.117	0.200	0.0643	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-210	0.941	U	2.14	2.15		1.72	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-212	0.670		0.128	0.154		0.0582	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Lead-214	0.615		0.132	0.147		0.0656	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Potassium-40	13.1		2.03	2.43		0.343	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Protactinium-231	0.000	U	0.641	0.641		3.05	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Radium-226	0.402		0.136	0.142	0.700	0.0537	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Radium-228	0.480		0.348	0.352		0.161	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thallium-208	0.238		0.0705	0.0747		0.0209	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-228	0.670		0.128	0.154		0.0582	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-232	0.480		0.348	0.352		0.161	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Thorium-234	-0.838	U	2.13	2.14		1.78	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Uranium-235	-0.296	U	0.570	0.570		0.512	pCi/g	07/25/18 12:46	08/15/18 06:50	1
Uranium-238	-0.838	U	2.13	2.14		1.78	pCi/g	07/25/18 12:46	08/15/18 06:50	1

QC Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-378105/9-A

Matrix: Solid

Analysis Batch: 381805

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 378105

Analyte	MB	MB	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Total Beta Strontium	0.05250		0.0624	0.0625	0.331	0.0466	pCi/g	07/26/18 08:49	08/13/18 06:41	1
<i>Carrier</i>	<i>MB</i>	<i>MB</i>								
<i>Sr Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>		<i>Limits</i>				<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
	85.7			40 - 110				07/26/18 08:49	08/13/18 06:41	1

Lab Sample ID: LCS 160-378105/1-A

Matrix: Solid

Analysis Batch: 381805

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 378105

Analyte	MB	MB	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec.	Limits
	Result	Qualifier									
Total Beta Strontium			8.21	8.007		0.646	0.331	0.0491	pCi/g	98	75 - 125
<i>Carrier</i>	<i>MB</i>	<i>MB</i>									
<i>Sr Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>		<i>Limits</i>							
	89.1			40 - 110							

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-377925/1-A

Matrix: Solid

Analysis Batch: 382508

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 377925

Analyte	MB	MB	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Actinium 228	-0.05262	U	0.285	0.285		0.153	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Actinium-227	0.1077	U	0.270	0.270		0.241	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Bismuth-212	-0.01851	U	0.719	0.719		0.194	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Bismuth-214	-0.1195	U	0.0991	0.0999		0.210	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Cesium-137	-0.04370	U	0.0577	0.0578	0.0700	0.0580	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Cobalt-60	-0.01621	U	0.0760	0.0760	0.200	0.0374	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Lead-210	0.3707	U	1.03	1.03		0.741	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Lead-212	-0.003219	U	0.0790	0.0790		0.0651	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Lead-214	-0.001829	U	0.0861	0.0861		0.0702	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Potassium-40	-0.2155	U	1.15	1.15		0.635	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Protactinium-231	0.0000	U	0.294	0.294		1.75	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Radium-226	-0.1195	U	0.0991	0.0999	0.700	0.210	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Radium-228	-0.05262	U	0.285	0.285		0.153	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Thallium-208	-0.006805	U	0.0411	0.0411		0.0287	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Thorium-228	-0.003219	U	0.0790	0.0790		0.0651	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Thorium-232	-0.05262	U	0.285	0.285		0.153	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Thorium-234	-0.1801	U	0.797	0.797		0.665	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Uranium-235	0.01489	U	0.0251	0.0252		0.214	pCi/g	07/25/18 12:46	08/15/18 09:53	1
Uranium-238	-0.1801	U	0.797	0.797		0.665	pCi/g	07/25/18 12:46	08/15/18 09:53	1

QC Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-377925/2-A

Matrix: Solid

Analysis Batch: 382512

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 377925

Analyte	Spike Added	LCS		Uncert. (2σ+/-)	Total		%Rec.	Limits
		Result	Qual		LOQ	DLC		
Americium-241	96.8	94.78		9.94		0.483	pCi/g	98 87 - 116
Cesium-137	28.2	27.48		2.92	0.0700	0.0927	pCi/g	97 87 - 120
Cobalt-60	12.9	12.25		1.28	0.200	0.0408	pCi/g	95 87 - 115

Lab Sample ID: 160-29717-1 DU

Matrix: Solid

Analysis Batch: 382512

Client Sample ID: PE2-RSYB3-U11-S001

Prep Type: Total/NA

Prep Batch: 377925

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	Limit
Actinium 228	0.603		0.7237		0.233		0.0591	pCi/g	0.18	1
Actinium-227	0.214	U	-0.05326	U	0.210		0.503	pCi/g	0.28	1
Bismuth-212	-0.414	U	1.237		0.456		0.0901	pCi/g	0.84	1
Bismuth-214	0.704		0.6349		0.186		0.0690	pCi/g	0.16	1
Cesium-137	0.00173	U	0.03433	U	0.0545	0.0700	0.0414	pCi/g	0.28	1
Cobalt-60	0.0326		0.01562	U	0.0551	0.200	0.0260	pCi/g	0.15	1
Lead-210	2.76		-0.06722	U	1.41		1.21	pCi/g	0.92	1
Lead-212	0.666		0.6898		0.138		0.0428	pCi/g	0.08	1
Lead-214	0.696		0.5935		0.133		0.0592	pCi/g	0.33	1
Potassium-40	8.91		10.78		1.84		0.294	pCi/g	0.45	1
Protactinium-231	0.697	U	0.0000	U	0.627		2.36	pCi/g	0.22	1
Radium-226	0.704		0.6349		0.186	0.700	0.0690	pCi/g	0.16	1
Radium-228	0.603		0.7237		0.233		0.0591	pCi/g	0.18	1
Thallium-208	0.301		0.1882		0.0660		0.0253	pCi/g	0.74	1
Thorium-228	0.666		0.6898		0.138		0.0428	pCi/g	0.08	1
Thorium-232	0.603		0.7237		0.233		0.0591	pCi/g	0.18	1
Thorium-234	0.0288	U	0.0000	U	0.929		1.34	pCi/g	0.01	1
Uranium-235	0.0844	U	-0.2020	U	0.282		0.448	pCi/g	0.52	1
Uranium-238	0.0288	U	0.0000	U	0.929		1.34	pCi/g	0.01	1

QC Association Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Rad**Leach Batch: 377706**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29717-1	PE2-RSYB3-U11-S001	Total/NA	Solid	Dry and Grind	
160-29717-2	PE2-RSYB3-U11-S002	Total/NA	Solid	Dry and Grind	
160-29717-3	PE2-RSYB3-U11-S003	Total/NA	Solid	Dry and Grind	
160-29717-4	PE2-RSYB3-U11-S004	Total/NA	Solid	Dry and Grind	
160-29717-5	PE2-RSYB3-U11-S005	Total/NA	Solid	Dry and Grind	
160-29717-6	PE2-RSYB3-U11-S006	Total/NA	Solid	Dry and Grind	
160-29717-7	PE2-RSYB3-U11-S007	Total/NA	Solid	Dry and Grind	
160-29717-8	PE2-RSYB3-U11-S008	Total/NA	Solid	Dry and Grind	
160-29717-9	PE2-RSYB3-U11-S009	Total/NA	Solid	Dry and Grind	
160-29717-10	PE2-RSYB3-U11-S010	Total/NA	Solid	Dry and Grind	
160-29717-11	PE2-RSYB3-U11-S011	Total/NA	Solid	Dry and Grind	
160-29717-12	PE2-RSYB3-U11-S012	Total/NA	Solid	Dry and Grind	
160-29717-13	PE2-RSYB3-U11-S013	Total/NA	Solid	Dry and Grind	
160-29717-14	PE2-RSYB3-U11-S014	Total/NA	Solid	Dry and Grind	
160-29717-15	PE2-RSYB3-U11-S015	Total/NA	Solid	Dry and Grind	
160-29717-16	PE2-RSYB3-U11-S016	Total/NA	Solid	Dry and Grind	
160-29717-17	PE2-RSYB3-U11-S017	Total/NA	Solid	Dry and Grind	
160-29717-18	PE2-RSYB3-U11-S018	Total/NA	Solid	Dry and Grind	
160-29717-1 DU	PE2-RSYB3-U11-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 377925

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29717-1	PE2-RSYB3-U11-S001	Total/NA	Solid	Fill_Geo-21	377706
160-29717-2	PE2-RSYB3-U11-S002	Total/NA	Solid	Fill_Geo-21	377706
160-29717-3	PE2-RSYB3-U11-S003	Total/NA	Solid	Fill_Geo-21	377706
160-29717-4	PE2-RSYB3-U11-S004	Total/NA	Solid	Fill_Geo-21	377706
160-29717-5	PE2-RSYB3-U11-S005	Total/NA	Solid	Fill_Geo-21	377706
160-29717-6	PE2-RSYB3-U11-S006	Total/NA	Solid	Fill_Geo-21	377706
160-29717-7	PE2-RSYB3-U11-S007	Total/NA	Solid	Fill_Geo-21	377706
160-29717-8	PE2-RSYB3-U11-S008	Total/NA	Solid	Fill_Geo-21	377706
160-29717-9	PE2-RSYB3-U11-S009	Total/NA	Solid	Fill_Geo-21	377706
160-29717-10	PE2-RSYB3-U11-S010	Total/NA	Solid	Fill_Geo-21	377706
160-29717-11	PE2-RSYB3-U11-S011	Total/NA	Solid	Fill_Geo-21	377706
160-29717-12	PE2-RSYB3-U11-S012	Total/NA	Solid	Fill_Geo-21	377706
160-29717-13	PE2-RSYB3-U11-S013	Total/NA	Solid	Fill_Geo-21	377706
160-29717-14	PE2-RSYB3-U11-S014	Total/NA	Solid	Fill_Geo-21	377706
160-29717-15	PE2-RSYB3-U11-S015	Total/NA	Solid	Fill_Geo-21	377706
160-29717-16	PE2-RSYB3-U11-S016	Total/NA	Solid	Fill_Geo-21	377706
160-29717-17	PE2-RSYB3-U11-S017	Total/NA	Solid	Fill_Geo-21	377706
160-29717-18	PE2-RSYB3-U11-S018	Total/NA	Solid	Fill_Geo-21	377706
MB 160-377925/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-377925/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29717-1 DU	PE2-RSYB3-U11-S001	Total/NA	Solid	Fill_Geo-21	377706

Prep Batch: 378105

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29717-1	PE2-RSYB3-U11-S001	Total/NA	Solid	DPS-0	377706
160-29717-11	PE2-RSYB3-U11-S011	Total/NA	Solid	DPS-0	377706
MB 160-378105/9-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-378105/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29717-2

Method: 905.0 - Total Beta Strontium (GFPC)**Matrix: Solid****Prep Type: Total/NA****Percent Yield (Acceptance Limits)**

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)										
160-29717-1	PE2-RSYB3-U11-S001	87.5										
160-29717-11	PE2-RSYB3-U11-S011	87.2										
LCS 160-378105/1-A	Lab Control Sample	89.1										
MB 160-378105/9-A	Method Blank	85.7										

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

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